Visvesvaraya Technological University, 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)   **(For the students who have attended 1semster under Chemistry 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-II** for ME Streams	Maths	3	0	2	0	03	50	50	100		04
2	#ASC(IC)	BPHYM202	**Applied Physics** for ME Streams	PHY	2	2	2	0	03	50	50	100		04
3	ESC	BEME203	Elements of Mechanical Engineering	Mechanical	2	2	0	0	03	50	50	100		03
4	ESC-II	BESCK204x	Engineering Science Course-II	Respective Engg Dept	3	0	0	0	03	50	50	100		03
5	PLC-II	BPLCK205x	Programming Language Course-II	Any Dept	2	0	2	0	03	50	50	100		03
			OR											
	ETC-II	BETCK205x	Emerging Technology Course-II		3	0	0	0	03					
6	AEC	BENGK206	Communicative English	Humanities	0	2	0	0	01	50	50	100		01
			OR											
		BPWSK206	Professional Writing Skills in English											
7	HSMC	BKSKK207 BKBKK207	Samskrutika Kannada/ Balake Kannada	Humanities	0	2	0	0	01	50	50	100		01
			OR											
		BICOK207	Indian Constitution											
8	AEC/SDC	BIDTK258	Innovation and Design Thinking	Any Dept	0	0	2	0	02	50	50	100		01
			OR											
		BSFHK258	Scientific Foundations of Health		1	0	0	0	01					
			TOTAL							400	400	800		20

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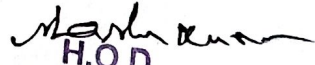
*- BMATM201 Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. ** **The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty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

#- BPHYM202 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 Communication	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
					BETCK205I	Introduction to Cyber Security	3	0	0
					BETCK205J	**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 to JAVA programming	2	0	2
BPLCK205D	Introduction to C++ Programming	2	0	2

The course BESCK204E, 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

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II Semester

Course Title:	Mathematics-II for Mechanical Engineering stream		
Course Code:	BMATM201	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 to 12 Lab slots	Credits	04

Course objectives: The goal of the course **Mathematics-II for Mechanical Engineering stream(22MATM21)** is to

- **Familiarize** the importance of Integral calculus and Vector calculus essential for Mechanical engineering.
- **Analyze** Mechanical engineering problems by applying Partial Differential Equations.
- **Develop** the knowledge of solving Mechanical engineering problems numerically.

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 students' 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 to 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:Integral Calculus (8 hours)

Introduction to Integral Calculus in Mechanical Engineering applications.

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral.Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems.

Self-Study: Volume by triple integration, Center of gravity.

Applications: Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.
(RBT Levels: L1, L2 and L3)

Module-2:Vector Calculus(8 hours)

Introduction to Vector Calculus in Mechanical Engineering applications.

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.

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Heat and mass transfer, oil refinery problems, environmental engineering, velocity and acceleration of moving particles, analysis of streamlines.

(RBT Levels: L1, L2 and L3)

Module-3:Partial Differential Equations (PDEs)(8 hours)

Importance of partial differential equations for Mechanical Engineering application.

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.

Self-Study: Solution of the one-dimensional heat equation and wave equation by the method of separation of variables.

Applications: Vibration of a rod/membrane.

(RBT Levels: L1, L2 and L3)

Module-4:Numerical Methods -1(8 hours)

Importance of numerical methods for discrete data in the field of Mechanical Engineering.
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: Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules(without proof). Problems.

Self-Study: Bisection method, Lagrange's inverse Interpolation.

Applications: Finding approximate solutions to solve mechanical engineering problems involving numerical data.

(RBT Levels: L1, L2 and L3)

Module-5:Numerical Methods -2(8 hours)

Introduction to various numerical techniques for handling Mechanical Engineering applications.

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.

Self-Study: Adam-Bashforth method.

Applications: Finding approximate solutions to solve mechanical engineering problems.

(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	Program to compute surface area, volume and centre of gravity
2	Evaluation of improper integrals
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

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 multiple integrals to compute area and volume.
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

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 total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Integrated Course (IC): Theory Integrated with practical Courses. **(4 Credits)**

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks.**

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totalling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.

- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.

- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester/after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks.**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject **(duration 03 hours)**

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- 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. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

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, 44[th]Ed., 2021.
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10[th]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, 3[rd]Ed., 2016.
3. N.P Bali and Manish Goyal: "A Textbook of Engineering Mathematics" Laxmi Publications, 10[th]Ed., 2022.
4. C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 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" CengagePublications, 7[th]Ed., 2019.

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							
CO2							
CO3							
CO4							
CO5							

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

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Course Title:	Applied Physics for ME Stream		
Course Code:	BPHYM102/202	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

- 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 understand the Concepts in Low temperature phenomena and generation of low temperature.
- To study the various relevant material characterization techniques.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Flipped Class
2. Chalk and Talk
3. Blended Mode of Learning
4. Simulations, Interactive Simulations and Animations
5. NPTEL and Other Videos for theory topics
6. Smart Class Room
7. Lab Experiment Videos

Module-1 (8 Hours)

Module -I: 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.

Pre-requisites: Basics of Oscillations
Self-learning: Simple Harmonic motion, Differential equation for SHM

Module-2 (8 Hours)

Elasticity

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 and derivation of expression, Cantilever and I section girder and their Engineering Applications, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), Numerical problems.

Pre requisites: Elasticity,Stress & Strain
Self-learning: Stress-Strain Curve

Module-3 (8 Hours)

Thermoelectric materials and devices:

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

Pre requisites: Basics of Electrical conductivity
Self-learning: Thermo emf and thermo current

Module-4 (8 Hours)

Cryogenics:
Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties, Platinum Resistance Thermometer, Applications of Cryogenics, in Aerospace, Tribology and Food processing(qualitative), Numerical Problems

Pre requisites: Basics of Heat and Thermodynamics
Self-learning: Application of Cryogenics in Food Processing

Module-5 (8 Hours)

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.

Pre requisites: Quantum Mechanics
Self-learning: Crystallites

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

CO1	**Elucidate** the concepts in oscillations, waves, elasticity and material failures
CO2	**Discuss** the fundamentals of Thermoelectric materials and their application
CO3	**Summarize** the low temperature phenomena and generation of low temperature
CO4	**Explain** the various material characterization techniques
CO5	**Practice** working in groups to conduct experiments in physics and **perform** precise and honest measurements.

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):
The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks.**

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IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

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- 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. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

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

1. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition
2. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
3. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997
4. Mechanical Properties of Engineered Materials by Wole Soboyejo, CRC Press; 1st edition, 2002
5. Heat & Thermodynamics and Statistical Physics(XVIII-Edition) – Singhal, Agarwal &Satyaprakash – Pragati Prakashan, Meerut, 2006. 4
6. Heat and Thermodynamics (I-Edition) – D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 1991
7. Heat and Thermodynamics, Brijlal & Subramanyam,S. Chand & Company Ltd., New-Delhi.
8. Physics of Cryogenics by Bahman Zohuri, Elsevier, 2018
9. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.
10. Characterization of Materials- Mitra P.K . Prentice Hall India Learning Private Limited.
11. Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.Ramachandra Rao & Shubra Singh, Wiley India Pvt Ltd.
12. Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, CRC Press.
13. Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi,2014

Web links and Video Lectures (e-Resources):

Simple Harmonic motion:https://www.youtube.com/watch?v=k2FvSzWeVxQ
Shock waves:https://physics.info/shock/
Shock waves and its applications:https://www.youtube.com/watch?v=tz_3M3v3kxk
Stress- strain curves:https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
Stress curves:https://www.youtube.com/watch?v=f08Y39UiC-o
Fracture in materials:https://www.youtube.com/watch?v=x47nky4MbK8
Thermoelecticity:https://www.youtube.com/watch?v=2w7NBuu5w9c&list=PLtkeUZItwHK5y6qy1GFxa4Z4RcmzUaaz6
Thermoelectric generator and coolers:https://www.youtube.com/watch?v=NruYdb31xk8
Cryogenics:https://cevgroup.org/cryogenics-basics-applications/
Liquefaction of gases:https://www.youtube.com/watch?v=aMelwOsGpIs
Virtual lab:https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
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
http://nptel.ac.in
https://swayam.gov.in
https://virtuallabs.merlot.org/vl_physics.html
https://phet.colorado.edu
https://www.myphysicslab.com

Laboratory Component:

Any 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. 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. Study of Forced Mechanical Oscillations and Resonance.
4. Study of the frequency response of Series & Parallel LCR circuits.
5. Determination of Fermi Energy of the given Conductor.
6. Determination of Resistivity by Four Probe Method.
7. Determination of effective spring constant of the given springs in series and parallel combinations.
8. Determination of Young's modulus of the material of the given bar Single Cantilever.
9. Determination of the Moment of Inertia of the given irregular body using torsional pendulum.
10. Determination of Wavelength of Laser using Diffraction Grating.
11. Determination of Acceptance angle and Numerical Aperture of the given Optical Fiber.
12. Determination of the Radius of Curvature of the given Plano Convex Lens by setting Newton's Rings.
13. Step Interactive Physical Simulations.
14. Study of motion using spread Sheets
15. Application of Statistics using Spread Sheets.
16. PHET Interactive Simulations
    :(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

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

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	2	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	1	-	2	-	-	3	3	-	-	2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped,

Note : The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competency and Performance Indicators** mentioned in the **AICTE Exam reforms**

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Course Title:		ELEMENTS OF MECHANICAL ENGINEERING		
Course Code:		BEMEM103/203	CIE Marks	50
Course Type (Theory/Practical/Integrated)		Theory	SEE Marks	50
			Total Marks	100
Teaching Hours/Week (L:T:P: S)		2:2:0:0	Exam Hours	03
Total Hours of Pedagogy		40 hours	Credits	03

Course Learning Objectives

CLO 1. Acquire a basic understanding about scope of mechanical engineering, fundamentals about steam and non-conventional energy sources.

CLO 2. Acquire a basic knowledge about conventional and advanced manufacturing processes.

CLO 3. Acquiring a basic understanding about IC engines, propulsive devices and air-conditioner.

CLO 4. Acquiring a basic knowledge about power transmission and joining processes.

CLO 5. Acquiring a basic insight into future mobility and mechatronics and robotics.

Teaching-Learning Process

- Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.

- Arrange visits to show the live working models other than laboratory topics.

- Adopt collaborative (Group Learning) Learning in the class.

- Adopt Problem Based Learning (PBL), which foster students' Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.

Module-1 (8 hours)

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.

Steam Formation and Application:

Modes of heat transfer, Steam formation, Types of steam, Steam properties and applications of steam (simple numerical problems).

Energy Sources and Power Plants:

Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant.

Module-2 (8 hours)

Machine Tool Operations:

Lathe: Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest,

Drilling Machine: Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,

Milling Machine: Working and types of milling machine, milling operations: plane milling, end 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, 3D printing.

Module-3 (8 hours)

Introduction to IC Engines: Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numerical).

Introduction to Refrigeration and Air Conditioning: Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners

Module-4 (8 hours)

Mechanical Power Transmission:
Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)
Belt Drives: Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)
Joining Processes: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames), TIG welding, MIG welding and Fusion welding.

Module-5 (8 hours)

Insight into future mobility technology; Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles.

Introduction to Mechatronics and Robotics: open-loop and closed-loop mechatronic systems. Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly and inspection.

Course outcome (Indicative)

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

CO1	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources
CO2	Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration.
CO3	Explain 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.

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):

Three Tests each of **20 Marks;**

- 1st, 2nd, and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.

- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of **40 Marks.**

  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to **50 marks**

Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.

- 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 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

- The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**

Suggested Learning Resources:

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

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, MediaPromoters and Publishers Pvt. Ltd., 2010.

Reference Books

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition,

2012

2.Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rdEd., 2003.

3.Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1

Web links and Video Lectures (e-Resources):

- . https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
- https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/Fundamental-Applications-of-Steam
- https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing- and-process-industry/)
- Videos | Makino (For Machine Tool Operation)

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

1. Visit to any manufacturing/aero/auto industry or any power plant
2. Demonstration of lathe/milling/drilling/CNC operations
3. Demonstration of working of IC engine/refrigerator
4. Demonstration of metal joining process
5. Video demonstration of latest trends in mobility/robotics

COs and POs Mapping (CO-PO mappings are only Indicative)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2				1	1			1		1
CO2	3	2				1	1			1		1
CO3	3	2				1	1			1		1
CO4	3	3				1	1					1
CO5												

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

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Course Title	**Introduction to C Programming**			
Course Code:	BESCK104E/204E	CIE Marks		50
Course Type (Theory/Practical /Integrated)	Integrated	SEE Marks		50
		Total Marks		100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours		03
Total Hours of Pedagogy	40 hours	Credits		03

CourseObjectives:

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

Teaching-LearningProcess(GeneralInstructions)

ThesearesampleStrategies,whichteacherscanusetoacceleratetheattainmentofthevariouscourseoutcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning)Learning in the class.
4. Ask atleast three HOT(Higher order Thinking) questions in the class,which promotes critical thinking.
5. Adopt Problem Based Learning (PBL),which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world-and when that's possible, it helps to improve the students' understanding.
9. Use https://pythontutor.com/visualize.html#mode=edit in order to visualize the operations of C Programs

Module-1 (6 Hours of Pedagogy)

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

Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation

Module-2 (6 Hours of Pedagogy)

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

Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation

Module-3 (6 Hours of Pedagogy)

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

Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation

Module-4 (6 Hours of Pedagogy)

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 techinques.

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

Textbook: Chapter 12.7-12.12

Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation

Module-5 (6 Hours of Pedagogy)

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

Pointers: Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables

Structures: Introduction to structures

Textbook: Chapter 13.1-13.6, 14.1-14.3,15.1

Teaching-LearningProcess	Chalkandtalkmethod/PowerPointPresentation

CourseOutcomes(CourseSkillSet)

Attheendofthecoursethestudentwillbeableto:

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

the hardware parts.

CO 2. Apply programming constructs of C language to solve the real world problem

CO 3.Explore user-defined data structures like arrays in implementing solutions to

problems like searching and sorting

CO 4.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

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):

The CIE marks for the theory component of the IC shall be **30 marks** and for the laboratory component **20 Marks.**

CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.

- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totaling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to **30 marks**

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.

- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.

- The laboratory test **(duration 03 hours)** at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to **05 marks.**

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IC/IPCC for **20 marks.**

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory component and 08 (40% of maximum marks) in the practical component. *The laboratory component of the IC/IPCC shall be for CIE only.* However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion

will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

Suggested Learning Resources:

Textbooks

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

Reference Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw-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 in understanding the topics and verities of problem solving methods.

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

- Quizzes
- Assignments
- Seminars

Lab Assignments

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 b_1, b_2, b_3 such that the equation is balanced on both sides and it must be the reduced form.
5	ImplementMatrixmultiplicationandvalidatetherulesofmultiplication.
6	Computesin(x)/cos(x)usingTaylorseriesapproximation.Compareyou result withthebuilt-inlibraryfunction.Printboththeresultswithappropriateinferences.

7	Sortthegivensetof N numbersusing Bubblesort.
8	Writefunctionstoimplementstringoperationssuchascompare,concatenate,stringlength.Convinceth eparameterpassingtechniques.
9	Implementstructurestoread,writeandcomputeaverage-marksandthestudentsscoringaboveandbelowtheaveragemarksforaclassof N students.
10	Developaprogramusingpointerstocomputethesum,meanandstandarddeviationofallelementsstored inanarrayof N realnumbers.

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Course Title:		GREEN BUILDINGS		
Course Code:	BETCK105B/205B	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

Course objectives: This course will enable students to:

- Understand the Definition, Concept & Objectives of the terms cost effective construction and green building
- Apply cost effective techniques in construction
- 3.Apply cost effective Technologies and Methods in Construction
- Understand the Problems due to Global Warming
- State the Concept of Green Building
- Understand Green Buildings

Teaching-Learning Process

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Civil Engineering structures.
3. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
4. Encourage collaborative (Group) Learning in the class.
5. Ask at least three HOT (Higher-order Thinking) questions in the class, which promotes critical thinking.
6. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
7. Topics will be introduced in multiple representations.
8. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
9. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.
10. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1 (08)

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- LimePoszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials- Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

Module-2 (08)

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - Costford - Nirmithi Kendra - Habitat

Module-3(08)

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in MaterialsGreen Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

Module-4(08)

Green Building rating Systems- BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only)

Module-5 (08)

Utility of Solar Energy in Buildings

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

Green Composites for Buildings

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

Course outcome (Course Skill Set)

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

CO1	Select different building materials for construction
CO2	Apply effective environmental friendly building technology
CO3	Analyze global warming due to different materials in construction
CO4	Analyse buildings for green rating
CO5	Use alternate source of energy and effective use water

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):

Three Tests each of 20 Marks;

- 1st, 2nd. and 3rd tests shall be conducted after completion of the syllabus of 30-35%, 70-75%, and 90-100% of the course/s respectively.

- Assignments/Seminar/quiz/group discussion /field survey & report presentation/ course project/Skill development activities, suitably planned to attain the COs and POs for a total of 40 Marks.

  If the nature of the courses requires assignments/Seminars/Quizzes/group discussion two evaluation components shall be conducted. If course project/field survey/skill development activities etc then the evaluation method shall be one.

Total CIE marks (out of 100 marks) shall be scaled down to 50 marks

Semester End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English). The duration of SEE is 03 hours.
- 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. The student has to answer for 100 marks and **marks scored out of 100 shall be proportionally reduced to 50 marks.**
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

Text Books
1. HarharaIyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices

Web links and Video Lectures (e-Resources):
• https://www.youtube.com/watch?v=THgQF8zHBW8
• https://www.youtube.com/watch?v=DRO_rIkywxQ
•
•

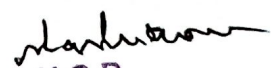| Activity Based Learning (Suggested Activities in Class)/ Practical Based learning |
| :--- |
| • Students have to visit a building which is green rated and prepare a report |

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

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	1				1	1					
CO2	2	1				1	1					
CO3	2	1				1	1					
CO4	2	1				1	1					
CO5	2	1				1	1					

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

Note: Depending on the assessment tool used, higher order POs can be identified by the concerned course instructor.

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Theory - 01 Credit Course   **BPWSK206-106**

Professional Writing Skills in English

Course Title:	Professional Writing Skills in English		
Course Code:	BPWSK206-106	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives:

The course Professional Writing Skills in English (22PWS26) will enable the students,

1. To Identify the Common Errors in Writing and Speaking of English.
2. To Achieve better Technical writing and Presentation skills for employment.
3. To read Technical proposals properly and make them to write good technical reports.
4. To Acquire Employment and Workplace communication skills.
5. To learn about Techniques of Information Transfer through presentation in different level.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning,

(v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio visual methods through language Labs in teaching of of LSRW skills.

Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills in teaching of communicative skills in general.

Language Lab : To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

Module-1	(03 hours of pedagogy)

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.

Module-2	(03 hours of pedagogy)

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.

Module-3	(03 hours of pedagogy)

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.

Module-4	(03 hours of pedagogy)

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.

Module-5	(03 hours of pedagogy)

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.

Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
CO1	To understand and identify the Common Errors in Writing and Speaking.
CO2	To Achieve better Technical writing and Presentation skills.
CO3	To read Technical proposals properly and make them to Write good technical reports.
CO4	Acquire Employment and Workplace communication skills.
CO5	To learn about Techniques of Information Transfer through presentation in different level.

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.

Suggested Learning Resources:

Textbook:

1) "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2) "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].

Reference Books:

1) **English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
2) **Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
3) **Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4) **High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.
5) **Effective Technical Communication** – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private

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

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments

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Indian Constitution

Course Title:	Indian Constitution		
Course Code:	BICOK107-207	CIE Marks	50
Course Type (Theory/Practical /Integrated)		SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

Course objectives :

The course **INDIAN CONSTITUTION (22ICO17 / 27)** will enable the students,

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective: Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools.

(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation based learning, (v) Personalized learning, (vi) Problems based learning through discussion.

(ii) Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students In theoretical applied and practical skills.

Module-1	(03 hours of pedagogy)

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.

Module-2	(03 hours of pedagogy)

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.

Module-3	(03 hours of pedagogy)

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.

Module-4	(03 hours of pedagogy)

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.

Module-5	(03 hours of pedagogy)

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.

Course outcome (Course Skill Set)

At the end of the course 22ICO17/27 the student will be able to:

CO1	Analyse 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.

Assessment Details (both CIE and SEE)

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Continuous Internal Evaluation(CIE):

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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.

Suggested Learning Resources:

Textbook:

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. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, **"Engineering Ethics"**, Prentice –Hall, 2004.

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

- ✓ Contents related activities (Activity-based discussions)
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- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions
- ✓ Seminars and assignments

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2

I Semester

INNOVATION and DESIGN THINKING			
Course Code	BIDTK158/258	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	15	Total Marks	100
Credits	01	Exam Hours	01

Course Category: Foundation

Preamble: This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

Course objectives:
- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1	
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	
Teaching-Learning Process	Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos

Module-2	
Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design	
Teaching-Learning	Case studies on design thinking for real-time interaction and analysis

Process	Simulation exercises for collaborated enabled design thinking
	Live examples on the success of collaborated design thinking

Module-3

Design Thinking in IT

Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping

Teaching-Learning Process	Case studies on design thinking and business acceptance of the design
	Simulation on the role of virtual eco-system for collaborated prototyping

Module-4

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.

Teaching-Learning Process	Business model examples of successful designs
	Presentation by the students on the success of design
	Live project on design thinking in a group of 4 students

Module-5

Design thinking workshop

Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test

Teaching-Learning Process	8 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop

Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Appreciate various design process procedure	K2
CO2	Generate and develop design ideas through different technique	K2
CO3	Identify the significance of reverse Engineering toUnderstand products	K2
CO4	Draw technical drawing for design ideas	K3

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 Tests (preferably in MCQ pattern) each of **30 Marks;** The first test after the completion of the 40 -50% syllabus of the course. A second test after the completion of 90-100% of the syllabus of the course.

- Two Assignments/two quizzes/two seminars/one field survey and report presentation/one-course project totaling **40 marks**

Total Marks scored (test + assignments) out of 100 shall be scaled down to **50 marks**

At the beginning of the semester, the instructor/faculty teaching the course has to announce the methods of CIE for the course.

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.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for subject

SEE paper will be set for 50 questions of each of 01 marks. The pattern of the question paper is MCQ. The time allotted for SEE is **01 hour**

Suggested Learning Resources:

Text Books :

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

References:

5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, Second Edition, 2011.
6. 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/. /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
   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
   thevirtualinstructor.com/foreshortening.html
   https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
   https://dschool.stanford.edu/use-our-methods/ 6. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process 7.
   http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49 8.
   https://www.nngroup.com/articles/design-thinking/ 9.
   https://designthinkingforeducators.com/design-thinking/ 10.
   www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

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

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

https://onlinecourses.nptel.ac.in/noc19_mg60/preview

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