NEW HORIZON
COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

DEPARTMENT OF MECHANICAL ENGINEERING

Scheme & Syllabus
THIRD & FOURTH SEMESTERS B.E

Batch: 2021-25 (As per NEP)
BE-Mechanical Engineering

CONTENTS

VISION

To create competent mechanical engineers capable of working in diversified disciplines for transformative impact on societal progressive development in the field of mechanical engineering through creative research and lifelong learning.

MISSION

➢ To impart excellent education by proving state of art research facilities in the field of mechanical engineering.
➢ To develop alliances with industries and other organizations for excellence in teaching learning process, research and consultancy projects.
➢ To enhance the students in intellectual, entrepreneurial and ethical challenges through active participation by critical thinking.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

➢ **PEO 1**: The graduates will be able to apply the overall knowledge of Mechanical Engineering along with concepts of Mathematics, Science, Communication and Computing skills to understand specific problem areas and finding the optimal solutions for the same.

➢ **PEO 2**: The graduates will be able to implement ideas of Mechanical Engineering for the challenging tasks in the interdisciplinary areas like Electrical, Electronics, Computer Science, Civil, Bio-Technology and allied branches.

➢ **PEO 3**: The graduates will be widely talented in the fields of manufacturing, service and design industries, which will not only improve their employability but also aid in establishing the above said industries.

➢ **PEO 4**: The graduates will develop lifelong learning attitudes, ethics and values that will help their career employability and growth in engineering, academia, defence, state and central government sectors.

MAPPING OF PEOs TO DEPARTMENT MISSION

Program Educational Objectives	M1	M2	M3
PEO 1	3	2	3
PEO 2	2	1	3
PEO 3	3	2	2
PEO 4	2	2	3

PROGRAM OUTCOMES (POs)

Graduate Attributes	PO #	Program Outcomes
Engineering knowledge	1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex mechanical engineering problems
Problem Analysis	2	Identify, formulate, review research literature, and analyze complex engineering problems in Mechanical Engineering reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
Design Development of Solutions	3	Design solutions for complex engineering problems and design system components or processes of Mechanical Engineering that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
Conduct Investigations of Complex Problems	4	Use research-based knowledge and research methods including design of experiments in Mechanical Engineering, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
Modern tool usage	5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities in Mechanical Engineering with an understanding of the limitations.
The Engineer and society	6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice in Mechanical Engineering.
Environment and Sustainability	7	Understand the impact of the professional engineering solutions of mechanical Engineering in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
Ethics	8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
Individual & team work	9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
Communication	10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project management and finance	11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, manage projects and in multidisciplinary environments.
Lifelong learning	12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After successful completion of mechanical Engineering Program, the graduates will be able to:

PSO1	Specify, fabricate, test and operate various machines along with essential documentations.
PSO2	Analyze, design, develop and implement the concepts of mechanical systems and processes towards product development

New Horizon College of Engineering

Department of Mechanical Engineering

Sl. No.	Course Code	Course Name	BOS	L	T	P	S	Overall Credits	Contact Hours	CIE	SEE	Total
		Third Semester Scheme										
1	21MEE 31A	Applied Mathematics-III	AS	3	0	0	0	3	3	50	50	100
2	21MEE 322A	Computer Aided Machine Drawing	ME	1	0	1	0	2	3	50	50	100
3	21HSS 332A/21 HSS333A	Aadalitha Kannada /Vyavaharika Kannada	HSS	1	0	0	0	1	1	50	50	100
4	21HSS 342A	Environmental Science	HSS	1	0	0	0	1	1	50	50	100
5	21MEE 35A	Fluid Mechanics and Hydraulic Machines.	ME	3	0	0	0	3	4	50	50	100
6	21MEL 35A	Fluid Mechanics and Hydraulic Machines Lab	ME	0	0	1	0	1	2	50	50	100
7	21MEE 36A	Mechanics of Materials	ME	3	0	0	0	3	4	50	50	100
8	21MEL 36A	Mechanics of Materials Lab	ME	0	0	1	0	1	2	50	50	100
9	21MEE 37A	Mechanical Measurements and Metrology	ME	3	0	0	0	3	4	50	50	100
10	21MEL 37A	Mechanical Measurements and Metrology Lab	ME	0	0	1	0	1	2	50	50	100
11	21MEE 38A	Mini Project - I	ME	0	0	2	0	2	4	50	50	100
		Total						21	30	550	550	1100

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Sl. No	Course Code	Course Name	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
				L	T	P	S			CIE	SEE	Total
1	21MEE 41A	Applied Mathematics-IV	AS	3	0	0	0	3	3	50	50	100
2	21HSS 421A	Life Skills for Engineers	HSS	1	0	1	0	2	3	50	50	100
3	21HSS 431A	Entrepreneurship Development -II	HSS	1	0	0	0	1	1	50	50	100
4	21HSS 441A	Constitution of India & Professional Ethics	HSS	1	0	0	0	1	1	50	50	100
5	21MEE 45A	Engineering Thermodynamics	ME	3	0	0	0	3	4	50	50	100
6	21MEL 45A	Engineering Thermodynamics Lab	ME	0	0	1	0	1	2	50	50	100
7	21MEE 46A	Manufacturing Technology	ME	3	0	0	0	3	4	50	50	100
8	21MEL 46A	Manufacturing Technology Lab	ME	0	0	1	0	1	2	50	50	100
9	21MEE 47A	Material Science & Metallurgy	ME	3	0	0	0	3	4	50	50	100
10	21MEL 47A	Simulation Lab	ME	0	0	1	0	1	2	50	50	100
11	21MEE 48A	Summer Internship-I #	ME	0	0	0	2	2	0	100	--	100
Total								21	26	600	500	1100

The table title row reads: **Fourth Semester Scheme**

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Department of Mechanical Engineering

Lateral Entry Students

Sl No.	Course Code	Course	BoS	Credit Distribution					Overall Credits	Contact Hours	Marks		
				L	T	P	S				CIE	SEE	Total
1	21DMAT 31A	Basic Applied Mathematics -1	AS	0	0	0	0		0	2	50	50	100
2	21DAEC 40A	Communicative English	HSS	0	0	0	0		0	2	50	50	100
3	21DMAT 41A	Basic Applied Mathematics - 2	AS	0	0	0	0		0	2	50	50	100

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THIRD SEMESTER SYLLABUS

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Department of Mechanical Engineering

APPLIED MATHEMATICS – III

Course Code	21MEE31A
L: T: P: S	3:0:0:0
Exams Hours	03

Credits	03
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE31A.1	Use appropriate numerical methods to solve algebraic equations and transcendental equations
21MEE31A.2	Differentiate the physical problems numerically, evaluate a definite integral numerically and use appropriate numerical methods to solve boundary value problems in partial differential equations.
21MEE31A.3	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data and obtain the extremal of a functional.
21MEE31A.4	Express the periodic functions as Fourier series expansion analytically and numerically.
21MEE31A.5	Solve the continuous model problems using Fourier transforms.
21MEE31A.6	Applying Fast Fourier transforms method, solve the discrete model problems.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE31A.1	3	3	3	3	3	-	3	-	-	-	3	3		
21MEE31A.2	3	3	3	3	3	-	3	-	-	-	3	3		
21MEE31A.3	3	3	3	3	3	1	3	-	-	1	3	3		
21MEE31A.4	3	3	3	3	3	-	-	-	-	-	3	3		
21MEE31A.5	3	3	3	3	3	-	-	-	-	-	3	3		
21MEE31A.6	3	3	3	3	3	-	-	-	-	-	3	3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

REFERENCE BOOKS:

1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

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Syllabus

Module No	Module Contents	Hrs	COs
1	**Numerical Methods-1:** Numerical solution of algebraic and transcendental equations: Regula-falsi method and Newton-Raphson method-Problems. Interpolation: Newton's forward and backward formulae for equal intervals, Newton divided difference, Lagrange's formula and Lagrange's inverse interpolation formula for unequal intervals (without proofs)-Problems. Case studies on Numerical Analysis.	9	21MEE31A.1
2	**Numerical Methods-2:** Numerical Differentiation: Derivatives of first order and second order using Newton's forward differences and Newton's backward differences. Numerical integration: Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule (without proofs)-Problems. **Applications:** Application of numerical integration to velocity of a particle and volume of solids. Numerical solution of one-dimensional wave equation, heat equation and two-dimensional Laplace's equation.	9	21MEE31A.2
3	**Statistical Methods and Calculus of Variation:** Fitting of the curves of the form $y = a + bx$, $y = a + bx + cx^2$, $y = a\,e^{bx}$, $y = a\,x^b$ and $y = a\,b^x$ by the method of least square-Problems. Correlation and Regression lines - Problems. Variation of a function and functional, variational problems, Euler's equation and Isoperimetric problems. **Applications:** Minimal surface of revolution, Hanging cable and Brachistochrone problem.	9	21MEE31A.3
4	**Fourier series:** Periodic function, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period $2l$, half range series-Problems. **Applications:** Practical harmonic analysis-Problems. Case studies on Fourier Series.	9	21MEE31A.4
5	**Fourier Transforms:** Infinite Fourier transforms, Fourier Sine and Cosine transforms, Inverse Fourier sine and cosine transforms. **Discrete Fourier Transform and Fast Fourier Transform:** Definition of N-Point DFT, problems for 4-points and inverse DFT for four points only. FFT algorithm to compute the Fourier transforms 4-point only.	9	21MEE31A.5 21MEE31A.6

New Horizon College of Engineering

Department of Mechanical Engineering

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	25	15	10
Remember	5	5	
Understand	5	5	
Apply	10	5	10
Analyze	2.5		
Evaluate	2.5		
Create			

SEE (50 Marks – Theory/Lab)

Bloom's Category	Tests (theory)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	

New Horizon College of Engineering
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COMPUTER AIDED MACHINE DRAWING

Course Code	21MEE322A		Credits	02
L: T: P: S	1:0:1:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE322A.1	Solve problems on sections of solids.
21MEE322A.2	Draw different types of thread forms, fasteners, coupling and Joints.
21MEE322A.3	Understand the Indian Standards in Engineering drawing practices.
21MEE322A.4	Relate the limits, fits and tolerance on component dimensions along with GD&T.
21MEE322A.5	Apply surface modeling concepts to create 3D surfaces.
21MEE322A.6	Create 3D assembly of machine components using advanced CAD software.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE322A.1	3	2			2					2				
21MEE322A.2	3	2			2					2				
21MEE322A.3	3									2				
21MEE322A.4	3	2	2		2					2		2		
21MEE322A.5	3	2	2		2					2		2		2
21MEE322A.6	3	2	2		2					2		2		2

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) 'Machine Drawing', K.R. Gopala Krishna, Subhash Publication, 2017, ISBN-139789383214235
2) 'Machine Drawing' N. D. Bhat, V M Panchal, Charotar Publication House, 2014, ISBN: 9789385039232, 9385039237

REFERENCE BOOKS:

1) 'Machine Drawing with Auto CAD', Goutam Pohit & Goutham Ghosh, 1st Indian print Pearson Education, 2005, ISBN: 13-978-8131706770
2) 'Machine Drawing', N. Siddeshwar, P. Kanniah, V.V.S. Sastri, published by Tata McGraw Hill,2014, ISBN**:** 007460337X / 9780074603376
3) 'Machine Drawing' Junnarkar N. D., Pearson Education, 2007, ISBN:8131706788

4) Textbook of Machine Drawing' K. C. John, PHI, 2009, 1st Edition, ISBN-13 : 978-8120337213
5) 'A Textbook of Machine Drawing' P. S. Gill, S.K. Kataria & Sons, 2013 Edition, ISBN-13 : 978-9350144169
6) 'A Textbook of Machine Drawing' R. K. Dhawan, S. Chand, 2nd Revised Edition 2006

Bureau of Indian Standards (BIS): SP-46, 2003
NPTEL Web Course: https://nptel.ac.in/courses/112103019/
NPTEL Video Course: https://nptel.ac.in/syllabus/112106075/

Syllabus

Module No	Module Contents	Hrs	COs
1	**Sections of Solids**: Sections of Pyramids, Prisms, Cubes, Tetrahedrons, Cones and Cylinders resting only on their bases (No problems on axis inclinations, spheres and hollow solids), True shape of sections **Thread Forms & Fasteners**: Thread terminology, Popular forms of screw threads, simple assembly using stud bolts with nut and lock nut. Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw	6	**21MEE322A.1** **21MEE322A.2**
2	**Introduction to 2d drafting**: **Couplings:** Flange, Universal, Oldham's, Muff, Gear couplings **Joints**: Knuckle, Gib & cotter, strap, sleeve & cotter joints **Keys & Joints**: Parallel key, Taper key, Feather key, Gibhead key and Woodruff key	6	**21MEE322A.3**
3	**Geometric dimensioning and tolerance**: Introduction to limits, fits and tolerances, dimensional and geometric tolerances, surface finish symbols. Practical examples using industrial drawings	3	**21MEE322A.4**
4	**Surface modelling**: Generation of 3-D sheet metal model involving 5 to 6 operations, Tray, Jug, Funnel, Transition pieces, Petrol/diesel measuring can etc.	10	**21MEE322A.5**
5	**3D Geometric modeling and assembly:** (Part drawings should be given) **Machine components** – Screw jack (Bottle type), Plummer block (Pedestal Bearing), Machine vice, I.C. Engine connecting rod, Rams Bottom Safety Valve, Tailstock of lathe, Tool Head of a shaper	15	**21MEE322A.6**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Report
Marks	**25**	**15**	**10**
Remember	4		
Understand	4		
Apply	6	3	5
Analyze	8	7	5
Evaluate	3	5	
Create			

SEE (50 Marks – Theory/Lab)

Bloom's Category	Tests (theory)
Remember	8
Understand	7
Apply	10
Analyze	15
Evaluate	5
Create	5

New Horizon College of Engineering

Department of Mechanical Engineering

ಆಡಳಿತ ಕನ್ನಡ (KANNADA FOR ADMINISTRATION)

Course Code	21HSS332A		Credits	01
L: T: P: S	1:0:0:0		CIE Marks	50
Exams Hours	02		SEE Marks	50

ಆಡಳಿತ ಕನ್ನಡ ಅಧ್ಯಯನದ ಕಲಿಕಾಂಶಗಳು

21HSS332A .1	ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗು ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ
21HSS332A .2	ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿನ್ನೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು
21HSS332A .3	ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ ಪಡೆಯುವರು
21HSS332A .4	ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ವಹಿಸಿಕೊಳ್ಳುವರು

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS332A .1										3				
21HSS332A .2										3				
21HSS332A .3										3				
21HSS332A .4										3				

ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)

ಅಧ್ಯಾಯ 1- ಕನ್ನಡ ಭಾಷೆ -ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ

ಅಧ್ಯಾಯ 2- ಭಾಷಾ ಪ್ರಯೋಗದಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ

ಅಧ್ಯಾಯ 3- ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ

ಅಧ್ಯಾಯ 4- ಪತ್ರ ವ್ಯವಹಾರ

ಅಧ್ಯಾಯ 5- ಆಡಳಿತ ಪತ್ರಗಳು

ಅಧ್ಯಾಯ 6- ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು

ಅಧ್ಯಾಯ 7- ಸಂಕ್ಷಿಪ್ತ ಪ್ರಬಂಧ ರಚನೆ(ಪ್ರಿಸೈಸ್ ರೈಟಿಂಗ್) ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ

ಅಧ್ಯಾಯ 8- ಕನ್ನಡ ಶಬ್ದ ಸಂಗ್ರಹ

ಅಧ್ಯಾಯ 9- ಕಂಪ್ಯೂಟರ್ ಹಾಗು ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ

ಅಧ್ಯಾಯ 10- ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ/ ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು

ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದ ಲೇಖಕರು

ಡಾ. ಎಲ್ . ತಿಮ್ಮೇಶ, ಪ್ರೊ.ವಿ . ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ, ವಿ. ತಾ.ವಿ. ಬೆಳಗಾವಿ

ಪರೀಕ್ಷೆಯ ವಿಧಾನ :

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (Continuous Internal Evaluation):50 ಅಂಕಗಳು

ಸೆಮಿಸ್ಟರ್ ಪರೀಕ್ಷೆ(Semester End Examination): 50 ಅಂಕಗಳು

Bloom's Category	CIE(50)	SEE(50)
Remember	25	25
Understand	25	25

New Horizon College of Engineering

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VYAVAHARIKA KANNADA (KANNADA FOR USE)

Course Code	21HSS333A		Credits	01
L: T: P: S	1:0:0:0		CIE Marks	50
Exams Hours	02		SEE Marks	50

Course Outcome: On completion of the course student will be able to:

21HSS333A.1	Understand Kannada Language.
21HSS333A.2	Communicate in Kannada Language
21HSS333A.3	Read simple Kannada words
21HSS333A.4	Pronounce Kannada words correctly

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS333A.1										3				
21HSS333A.2										3				
21HSS333A.3										3				
21HSS333A.4										3				

Syllabus

Chapter – 1: Vyavaharika Kannada – Parichaya (Introducton to Vyavaharika Kannada)

Chapter – 2: Kannada Aksharamale haagu uchharane (Kannada Alphabets and Pronunciation)

Chapter – 3: Sambhashanegaagi Kananda Padagalu (Kannada Vocabulary for Communication)

Chapter – 4: Kannada in Conversations (Sambhashaneyalli Kannada)

Chapter – 5: Activities in Kannada. (Kannada Sambhashanegaagi Chatuvatikegalu)

Text Book:

   Vyavaharika Kannada by Dr. L. Thimmesh, Prof. V. Keshavamurthy, published by: VTU, Belagavi

Continuous Internal Evaluation & Semester End Examination : (50 marks Each)

Bloom's Category	CIE(50)	SEE(50)
Remember	25	25
Understand	25	25

New Horizon College of Engineering

Department of Mechanical Engineering

ENVIRONMENTAL SCIENCE

Course Code	21HSS342A		Credits	01
L: T: P: S	1:0:0:0		CIE Marks	50
Exams Hours	02		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21HSS342A.1	Understand the concepts of Environment, ecosystem and biodiversity.
21HSS342A.2	Explain the strategies for management of natural resources to achieve sustainability.
21HSS342A.3	Analyze the control measures of Environmental pollution and global Environmental issues.
21HSS342A.4	Apply the knowledge of Environment Impact Assessment, Technology, Environmental acts and laws in protecting Environment and human health.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS342A.1						3	3							
21HSS342A.2						3	3					3	1	
21HSS342A.3						3	3	3		3		3	1	
21HSS342A.4					1	3	3	3		3		3	1	1

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1. Environmental studies by Benny Joseph, Tata McGraw Hill Education Private Limited, 2009, ISBN: 9870070648135.
2. "Environmental Studies: Basic Concepts" by Ahluwalia, V. K. The Energy and Resources Institute (TERI) Publication, 2nd edition, 2016. ISBN: 817993571X, 9788179935712.
3. "Textbook of Environmental Studies for Undergraduate Courses of all branches of Higher Education" by Bharucha, Erach for UGC, New Delhi, 2004. ISBN: 8173715408, 9788173715402.

REFERENCE BOOKS:

1. Handbook of Environmental Engineering by Rao Surampalli, Tian C. Zhang, Satinder Kaur Brar, Krishnamoorthy Hegde, Rama Pulicharla, Mausam Verma; McGraw Hill Professional, 2018. ISBN: 125986023X, 9781259860232
2. Environmental Science and Engineering by P. Venugopala, Prentice Hall of India Pvt. Ltd, New Delhi, 2012 Edition. ISBN: 978-81-203-2893-8.
3. Environmental Science- Working with the earth by G Taylor Miller Jr, Brooks Cole Thompson Publications, 10thEdition. ISBN: 10: 0534424082.
4. Elements of Environmental Science and Engineering by P. Meenakshi, Prentice Hall of India Pvt. Ltd, 2005 Edition. ISBN: 8120327748, 9788120327740.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Module No	Module Contents	Hrs	COs
1	**Introduction to Environment, Ecosystem and Biodiversity:** Environment: Definition, Components of Environment; Ecosystem: Types & Structure of Ecosystem, Energy flow in the ecosystem; Biodiversity: Types, Hot-spots, Threats and Conservation of biodiversity.	3	21HSS342A.1
2	**Natural Resources:** Advanced Energy resources(Hydrogen, Solar, OTEC, Tidal and Wind), merits and demerits, Water resources – cloud seeding, Mineral resources, Forest resources. Strategies of management, concept of sustainability.	3	21HSS342A.2
3	**Environmental Pollution:** Definition, Causes, effects and control measures of Air Pollution, Water Pollution, soil Pollution and Noise pollution. Solid waste sand its management. Role of society, NGO and Govt. agencies in prevention of pollution.	3	21HSS342A.3
4	**Global Environmental issues, Environment acts and amendments:** Fluoride problem in drinking water, Acid Rain, Ozone layer depletion, Global warming and climate change. National forest policy, Environmental laws and acts. International agreements and protocols.	3	21HSS342A.3 21HSS342A.4
5	**Human Population and Environment Impact Assessment:** Population growth & explosion, Population pyramids. Negative impact of agriculture and urbanization, Role of Technology in protecting environment and human health. Environment Impact Assessment.	3	21HSS342A.4

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5		
Understand	15		
Apply	5	8	5
Analyze		7	5
Evaluate			
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	10
Understand	30
Apply	10
Analyze	
Evaluate	
Create	

New Horizon College of Engineering

Department of Mechanical Engineering

FLUID MECHANICS AND HYDRAULIC MACHINES

Course Code	21MEE35A		Credits	03
L: T: P:S	3:0:0:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE35A.1	Understand the properties of fluids and Compute the parametric behaviour when acting on simple aerodynamic profiles and shapes in steady fluid flows.
21MEE35A.2	Identify the various losses for fluids flowing through a pipe and Implement the concepts of fluid statics, fluid kinematics and fluid dynamics in the applications of Hydraulics machinery.
21MEE35A.3	Analyze the types of fluid flow, different flow description and design a flow measuring device to analyze the discharge of fluid.
21MEE35A.4	Determine various equipment sizing / design aspects of turbo machines based on engineering requirement with the application of Continuity and Bernoulli's equations in order to develop solution for fluid flow process.
21MEE35A.5	Investigate the concepts as a member of a team and make an effective presentation on the application of suitable turbo machines under / within the specified conditions.
21MEE35A.6	Design and analysis of turbo machines by applying the knowledge to practical engineering problems for better sustainable solutions and staying updated with the latest developments.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE35A.1	3	3												3
21MEE35A.2	3	3												3
21MEE35A.3	3	3	3										3	3
21MEE35A.4	3												3	
21MEE35A.5									1	1				
21MEE35A.6	3	3	3									1	3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) Bansal R.K., "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publications (P)Ltd., New Delhi, 2018.

2) R.K.Rajput, "A Text Book of Fluid Mechanics and Hydraulic Machines", 6th edition, S. Chand, 2015.

REFERENCE BOOKS:

1) Yunus A. Cengel and John M. Cimbala., 'Fluid Mechanics', McGraw Hill, 4th Edition, 2017, ISBN-(13 digits): 978-9385401374.

2) P.N.Modi and Seth, "Fluid Mechanics and Hydraulic Machines",22nd edition, Standard Book House, 2018.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Module No	Module Contents	Hrs	COs
1	**Fluid Properties and Fluid Statics:** Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Surface Tension, Capillarity, Compressibility, Vapour pressure**:** Pascal's law, Hydrostatic law (No numerical). **Buoyancy:** Buoyancy, centre of buoyancy, Archimedes' principle, metacentre and metacentric height, stability of floating and submerged bodies, determination of Metacentric height by experimental method. (Numerical on Meta centre and centre of Buoyancy)	9	**21MEE35A.1** **21MEE35A.2**
2	**Fluid Kinematics**: Types of Flow, Continuity equation in 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function (Numerical). **Fluid Dynamics:** Euler equation of motion along and Bernoulli's equation from Euler's equation (Numerical). Application of Bernoulli's equation to Pitot tube, venturimeter, orifice meter (No Derivation and Numerical on discharge equation). **Case Study-** Design & Fabrication of stepped notch/trapezoidal notch and perform the experiments.	9	**21MEE35A.2** **21MEE35A.3** **21MEE35A.4**
3	**Flow Through Pipes:** Energy losses through pipe, Major losses, Darcy- Weisbach equation, Chezy's Equation, Minor losses in pipes-sudden enlargement, sudden contraction (Numerical). **Laminar And Turbulent Flow:** Definition, Relation between pressure and shear stresses, Laminar flow through circular pipe, Fixed parallel plates, Turbulent flow and velocity distribution. (Numerical)	9	**21MEE35A.2** **21MEE35A.3** **21MEE35A.4**
4	**Hydraulic pumps:** Concept and classification of pumps, Detailed study (construction, working and applications) of Centrifugal pump & Reciprocating pump. Performance (efficiency, discharge, head, specific speed and power consumption) of centrifugal pump and reciprocating pump with simple numerical example. Characteristic curves of centrifugal pump and reciprocating pump, Need for priming of centrifugal pump & Selection of pumps **Case Study-** Hands-on experience on selecting procedure of pump for different scenario.	9	**21MEE35A.4** **21MEE35A.5** **21MEE35A.6**
5	**Hydraulic Turbines:** Classification, construction, Design, working principle and applications of: Pelton wheel, Francis's turbine, Kaplan turbine. **Performance of hydraulic turbines:** Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitations. **Case Study-** Fabrication & Construction of turbine models based on power generation capacity.	9	**21MEE35A.4** **21MEE35A.5** **21MEE35A.6**

New Horizon College of Engineering

Department of Mechanical Engineering

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	4		
Understand	4		
Apply	6	3	5
Analyze	8	7	5
Evaluate	3	5	
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	8
Understand	7
Apply	15
Analyze	15
Evaluate	5
Create	

New Horizon College of Engineering

Department of Mechanical Engineering

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Code	21MEL35A		Credits	01
L: T: P:S	0:0:1:0		CIE Marks	50
Exams Hours	02		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL35A.1	Calibrate flow measuring devices such as Venturi meter, orifice meter and Notches and predict the coefficient of discharge for flow through pipes
21MEL35A.2	Estimate the friction and measure the frictional losses in fluid flow
21MEL35A.3	understand the fuel properties like viscosity and its measurements using various types of measuring devices and also Analyze different types of fluid flow by using Reynold's apparatus
21MEL35A.4	Understand the knowledge of impact of jet on various types of vanes and performance of hydraulic turbine and pumps under different working conditions

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL35A.1	3	3	3	3									3	
21MEL35A.2	3	3	3	3									3	
21MEL35A.3	3	3	3	3									3	
21MEL35A.4	3	3	3	3									3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXTBOOKS :

1) P.N.Modi and Seth, "Fluid Mechanics and Hydraulic Machines",22nd edition, Standard Book House, 2018.
2) Bansal R.K., "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publications (P)Ltd., New Delhi, 2018.

REFERENCEBOOKS :

1) R.K.Rajput, "A Text Book of Fluid Mechanics and Hydraulic Machines", 6th edition, S. Chand, 2015.
2)Yunus A. Cengel and John M. Cimbala., 'Fluid Mechanics', McGraw Hill, 4th Edition, 2017, ISBN-(13 digits): 978-9385401374.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Exp. No.	Contents of Experiment	Hrs	COs
1.	Determination of viscosity of given lubricating oil using Saybolt / Redwood / Torsion Viscometer.	2	21MEL35A.3
2.	Calibration of given Venturi meter, Orifice meter and plotting the suitable calibration curve	2	21MEL35A.1
3.	Calibration of given V-notch, Rectangular and plotting the suitable calibration curve	2	21MEL35A.1
4.	Determination of coefficient of friction and Chezy's constant for turbulent flow in pipes.	2	21MEL35A.2
5.	Determination of minor losses coefficient in flow through pipes due to sudden contraction and sudden expansion.	2	21MEL35A.2
6.	Determination of the Reynolds Number and hence the Type of Flow using the Reynolds apparatus	2	21MEL35A.3
7.	To determine the impact of jet on hemispherical vanes, Flat Vanes and Inclined Vanes	2	21MEL35A.4
8.	To determine the performance characteristics of Single Stage &Multi stage centrifugal pump.	2	21MEL35A.4
9.	To determine the performance characteristics of reciprocating pump	2	21MEL35A.4
10.	To find the performance test on Pelton Wheel	2	21MEL35A.4
11.	To find the performance test on Francis's turbine	2	21MEL35A.4

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	**20**	**20**	**10**
Remember			2
Understand			2
Apply			2
Analyze	10	8	2
Evaluate	10	8	2
Create		4	

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	4
Understand	4
Apply	2
Analyze	20
Evaluate	20
Create	

New Horizon College of Engineering
Department of Mechanical Engineering
MECHANICS OF MATERIALS

Course Code	21MEE36A
L: T: P:S	3:0:0:0
Exams Hours	03

Credits	03
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE36A.1	Understand and calculate the simple stresses and strains induced in various bars of different cross sections, and the mechanical properties of materials in the design of structural members.
21MEE36A.2	Identify the behavior of beams under various lateral loads, by determining the shear force and bending moments, and the shear force diagrams and bending moment diagrams.
21MEE36A.3	Analyze the effects of bending and shear loads on structural members.
21MEE36A.4	Develop a working knowledge of the analytical methodologies used in column structural design.
21MEE36A.5	Design circular shafts subjected to torsional loads and, compute the stresses and strains in thick and thin cylindrical pressure vessel
21MEE36A.6	Apply structural mechanics of deformable bodies to solve engineering problems.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE36A.1	3	3	3	3	3									3
21MEE36A.2	3	3	3	3	3									3
21MEE36A.3	3	3	3	3	3									3
21MEE36A.4	3	3	3	3	3									3
21MEE36A.5	3	3	3	3	3									3
21MEE36A.6	3	3	3	3	3									3

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Ferdinand Beer & Russell Johston., 'Mechanics of Materials', McGraw Hill India, 7th Edition, 2016, ISBN- (13 digits): 9789339217624.
2) Ramamrutham S., 'Strength of Materials', DhanpatRai Publishing Co Pvt Ltd, 6th Edition, 2017, ISBN-(13 digits): 978-9352164387; ISBN-(10 digits): 9352164385

REFERENCE BOOKS:
1) R C Hibbeler., 'Mechanics of Materials', Pearson Education, 9th Edition, 2018, ISBN-(13 digits): 978- 9332584037; ISBN-(10 digits): 9332584036.
2) James M. Gere, Barry J. Goodno., 'Mechanics of Materials', Cengage Learning, 8th Edition, 2014, ISBN-(13 digits): 9788131524749.
3) S S Rattan., 'Strength of Materials', McGraw Hill India, 2nd Edition, 2011, ISBN-(13 digits): 978-0071072564; ISBN-(10 digits):007107256X.
4) Dr Rao V Dukkipati 'MATLAB for Mechanical Engineers', New Age Science (January 15, 2009), ISBN-10 : 1906574138, ISBN-13 : 978-1906574130.

New Horizon College of Engineering

Module No	Module Contents	Hrs	COs
1	**Simple Stress and Strain:** Assumptions in MOM, stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain curve for Mild steel, cast iron and Aluminum. Extension /Shortening of a bar, bars with cross section varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self-weight, Principle of super position, Thermal Stresses (No Numerical's), elastic constants (only definition). **Definition of Indeterminate structures** (No Numerical's).	9	**21MEE36A.1, 21MEE36A.6**
2	**Bending Moment and Shear Force Diagrams:** Introduction, Types of beams, loads and reactions, shear forces and bending moments, Rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams.	9	**21MEE36A.2, 21MEE36A.6**
3	**Bending and Shear Stresses in Beams:** Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress and radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections.	9	**21MEE36A.3, 21MEE36A.6**
4	**Deflection of Beams:** Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple, Macaulay's method. **Elastic Stability of Columns:** Introduction, Columns and struts, slenderness ratio, Classification of columns, buckling load or critical load, Sign conventions, Euler's theory of buckling, Effective length for various boundary conditions, Limitations of Euler's theory, Rankine formula, numerical.	9	**21MEE36A.3, 21MEE36A.4, 21MEE36A.6**
5	**Torsion of Circular Shafts:** Introduction, Pure torsion, assumptions, derivation of torsional equations, polar modulus, Torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts **Thick and Thin Cylinder:** Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders - Lame's equation, Problems on Lame's equation. Note: Following Problems should be solved by students and should be submitted as assignments using Software tools. 1. Finding the Principal stresses and Directional cosines of a given stress tensor. 2.Solving Buckling of column problems using software tools 3. Solving torsion of shafts problems using software tools 4. Calculation of Shear forces and Bending Moments for Beams subjects various kinds of loads using software tools. 5. Solving Truss Problems Using software tools.	9	**21MEE36A.5, 21MEE36A.6**

New Horizon College of Engineering

Department of Mechanical Engineering

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	4		
Understand	4		
Apply	6	3	5
Analyze	8	7	5
Evaluate	3	5	
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	8
Understand	7
Apply	15
Analyze	15
Evaluate	5
Create	

New Horizon College of Engineering
Department of Mechanical Engineering

MECHANICS OF MATERIALS LAB

Course Code	21MEL36A
L: T: P:S	0:0:1:0
Exams Hours	02

Credits	01
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL36A.1	Observe and examine the microstructure details of Ferrous and nonferrous materials.
21MEL36A.2	Understand the function on multi-disciplinary streams in the area of materials testing stresses and strains in the members subjected to axial, bending and torsional loads.
21MEL36A.3	Determine the impact strength, hardness and wear rate of various materials.
21MEL36A.4	Identify the surface defects through NDT techniques for ferrous and nonferrous materials.

Mapping of Course Outcomes to Program Outcomes:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL36A.1	3	3	3			3		3					3	
21MEL36A.2	3	3	3			3		3					3	
21MEL36A.3	3	3	3			3		3					3	
21MEL36A.4	3	3	3			3		3					3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Ferdinand Beer & Russell Johston., 'Mechanics of Materials', McGraw Hill India, 8th Edition, 2020, ISBN- (13 digits): 978-9390219421.
2) Ramamrutham S., 'Strength of Materials', Dhanpat Rai Publishing Co Pvt Ltd, 20th Edition, 2020, ISBN-(13 digits): 978-9352164387; ISBN-(10 digits): 9352164385.

REFERENCE BOOKS:
1) R C Hibbeler., 'Mechanics of Materials', Pearson Education, 9th Edition, 2018, ISBN-(13 digits): 978-9332584037; ISBN-(10 digits): 9789332584037.
2) James M. Gere, Barry J. Goodno., 'Mechanics of Materials', Cengage Learning, 9th Edition, 2017, ISBN-(13 digits): 978-1337093347, ISBN-(10 digits): 1337093343.
3) S S Rattan., 'Strength of Materials', McGraw Hill India, 3rd Edition, 2017, ISBN-(13 digits): 978-9385965517; ISBN-(10 digits): 9789385965517.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Exp. No.	Contents of Experiment	Hrs	COs
1	To determine the hardness number of aluminum specimen using Brinell hardness test.	2	21MEL36A.3
2	Evaluating the hardness number of hardened steel specimen using Vickers'shardness test.	2	21MEL36A.3
3	To determine the hardness number of mild steel/cast iron specimen usingRockwell hardness test.	2	21MEL36A.3
4	To determine the ultimate shear strength of the given specimen in single and double shear using UTM.	2	21MEL36A.2
5	To determine the moment of inertia, modulus of elasticity and maximum bending stress of wood specimen by conducting bending test.	2	21MEL36A.2
6	To determine the compressive strength, modulus of elasticity, % reduction in length and % increase in area of cast iron specimen by conducting compression test on universal testing machine.	2	21MEL36A.2
7	To determine the impact energy and strength of notched specimen using Izod test.	2	21MEL36A.3
8	To determine the impact energy and strength of notched specimen using Charpy test.	2	21MEL36A.3
9	To determine the modulus of rigidity, Torsional strength and modulus of toughness of mild steel specimen using torsion test.	2	21MEL36A.2
10	To determine the elastic strength, ultimate tensile strength, modulus of toughness and young's modulus of mild steel specimen by conductingtensile test on universal testing machine.	2	21MEL36A.2
11	To determine the wear rate of the given specimen using Pin on Disc apparatus.	2	21MEL36A.3
12	Metallographic examination and identification of microstructures of ferrous and non ferrous materials materials.	2	21MEL36A.1
13	Determination of cracks in given material using dye penetrant test.	2	21MEL36A.4
14	Determination of defects in given material using magnetic crack detector.	2	21MEL36A.4

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	20	20	10
Remember			2
Understand			2
Apply			2
Analyze	10	8	2
Evaluate	10	8	2
Create		4	

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	4
Understand	4
Apply	2
Analyze	20
Evaluate	20
Create	

New Horizon College of Engineering

Department of Mechanical Engineering

MECHANICAL MEASUREMENTS & METROLOGY

Course Code	21MEE37A		Credits	03
L: T: P: S	3:0:0:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE37A.1	Apply the concepts of metrology to identify the suitable standards for calibrating the end bars
21MEE37A.2	Design the gauges for engineering components using the concepts of Limits, fits, geometric dimensioning and tolerances (GD&T)
21MEE37A.3	Understand the working principle of various linear measuring instruments and principles of interference
21MEE37A.4	Analyze the various types of screw threads and gear tooth used in various applications and its measuring instruments
21MEE37A.5	Assess the surface finish on the components using various methods
21MEE37A.6	Identify appropriate measuring instruments for measurement of force, torque, pressure, temperature

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE37A.1	3	3												3
21MEE37A.2	3	3	1											3
21MEE37A.3	3	3											2	3
21MEE37A.4	3	3												3
21MEE37A.5	3	3												3
21MEE37A.6	3	3												3

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) R.K. Jain, 'Engineering Metrology', Khanna Publishers, 2017, ISBN-13: 978-8174091536.
2) Beckwith Marangoni and Lienhard, 'Mechanical Measurements', Pearson Education, 7th Edition, 2015, ISBN 13: 978-8131717189.
3) Dr. T Chandrashekar, 'Metrology and Measurement', Subhas publication, 2017, ISBN: 9789383214198.

REFERENCE BOOKS:
1) I.C. Gupta, 'Engineering Metrology', Dhanpat Rai Publications, Delhi, 8th Edition, 2018, ISBN 13: 9788189928452.
2) R.K. Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, 2008, ISBN: 9788174091918.
3) Anand K. Bewoor & Vinay A. Kulkarni, 'Metrology & Measurement', Tata McGraw Hill Pvt. Ltd., New Delhi, 2009, ISBN: 9781259081323.
4) N V Raghavendra and Krishnamurthy, 'Engineering Metrology and Measurement', Oxford University Press, 2013, ISBN: 9780198085492.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Module No	Module Contents	Hrs	COs
1	**Standards of measurement:** Definition and Objectives of metrology, Material standards-International Prototype meter, Imperial standard yard, Airy points, Wave length standard, subdivision of standards, line and end standard, calibration of end bars, Indian Standards (M-87, M- 112) of Slip gauges, Wringing phenomena, Numerical problems on building of slip gauges. **Measurements and measurement systems:** Generalized measurement system, basic definitions, Errors in measurement, classification of errors.	9	**21MEE37A.1** **21MEE37A.3**
2	**Limits, Fits, Tolerance and Gauge:** Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges- plain plug gauge, ring gauge, and gauge materials.	9	**21MEE37A.2**
3	**Comparators:** Introduction to comparators, characteristics, classification of comparators, Johnson's Mikrokator, Sigma comparator, Dial gauge, Ziess ultra-optimeter LVDT, Solex pneumatic gauge. Principles of interference, concept of flatness, flatness testing, optical flats, optical interferometer and laser interferometer.	9	**21MEE37A.3**
4	**Surface metrology:** Surface Texture Measurement - importance of surface conditions, roughness and waviness, surface roughness standards specifying surface roughness parameters- Ra, Ry, Rz, RMS value etc., surface roughness measuring instruments – Tomlinson and Taylor Hobson versions, surface roughness symbols. **Form Measurement:** Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. Tool maker's microscope, gear tooth terminology, gear tooth vernier caliper.	9	**21MEE37A.4** **21MEE37A.5**
5	**Measurement of force, torque, pressure:** Principle of analytical balance, platform balance, proving ring. Torque measurement-Prony brake, hydraulic dynamometer. Pressure measurements- McLeod gauge,Pirani gauge. **Measurement of Temperature:** Resistance thermometers, thermocouple, law of thermo couple	9	**21MEE37A.6**

Assessment Pattern

CIE (50 Marks – Theory)					SEE (50 Marks – Theory)	
Bloom's Category	**Tests**	**Assignments**	**Quizzes**		**Bloom's Category**	**Tests (theory)**
Marks	**25**	**15**	**10**			
Remember	5	5			Remember	5
Understand	5	5	5		Understand	5
Apply	10	5	5		Apply	15
Analyze	5				Analyze	15
Evaluate					Evaluate	10
Create					Create	

New Horizon College of Engineering

Department of Mechanical Engineering

MECHANICAL MEASUREMENTS AND METROLOGY LAB

Course Code	21MEL37A		Credits	01
L: T: P: S	0:0:1:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL37A.1	Calibrate the measuring instruments such as micrometer, pressure gauge, LVDT, load cell, thermocouple, strain gauge etc
21MEL37A.2	Determine the taper angle, surface roughness and alignment of machined components
21MEL37A.3	Measure the screw thread and gear tooth parameters of the specimens
21MEL37A.4	Compute the cutting forces and torque in drilling and turning using dynamometers

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL37A.1	3								3				3	
21MEL37A.2	3								3					3
21MEL37A.3	3	2							3					3
21MEL37A.4	3	2							3				3	3

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) R.K. Jain, 'Engineering Metrology', Khanna Publishers, 2017, ISBN-13: 978-8174091536.
2) Beckwith Marangoni and Lienhard, 'Mechanical Measurements', Pearson Education, 7th Edition, 2015, ISBN 13: 978-8131717189.
3) Dr. T Chandrashekar, 'Metrology and Measurement', Subhas publication, 2017, ISBN: 9789383214198.

REFERENCE BOOKS:

1) I.C. Gupta, 'Engineering Metrology', Dhanpat Rai Publications, Delhi, 8th Edition, 2018, ISBN 13: 9788189928452.
2) R.K. Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, 2008, ISBN: 9788174091918.
3) Anand K. Bewoor & Vinay A. Kulkarni, 'Metrology & Measurement', Tata McGraw Hill Pvt. Ltd., New Delhi, 2009, ISBN: 9781259081323.
4) N V Raghavendra and Krishnamurthy, 'Engineering Metrology and Measurement', Oxford University Press, 2013, ISBN: 9780198085492.

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Exp. No.	Contents of Experiment	Hrs	COs
1	Calibration of load cell using standard weights	2	21MEL37A.1
2	Calibration of micrometer using slip gauge	2	21MEL37A.1
3	Calibration of LVDT using micrometer	2	21MEL37A.1
4	Calibration of pressure gauge	2	21MEL37A.1
5	Measurement of Taper angle using sine bar and slip gauge	2	21MEL37A.2
6	Measurement of surface roughness of a component using mechanical comparator	2	21MEL37A.2
7	Measurement of screw thread parameters using Tool makers' microscope	2	21MEL37A.3
8	Measurement of a screw thread parameters using floating carriage micrometer by 2-wiremethod	2	21MEL37A.3
9	Measurement of gear parameters using gear tooth vernier	2	21MEL37A.3
10	Measurement of alignment of surface plate using roller set	2	21MEL37A.2
11	Comparison and measurement of temperature using thermocouple and RTD	2	21MEL37A.1
12	Measurement of cutting forces and torque using lathe/ drill tool Dynamometer	2	21MEL37A.4
13	Determination of young s modulus using strain gauge.	2	21MEL37A.1

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	20	20	10
Remember			2
Understand			2
Apply	10	10	4
Analyze	10	10	2
Evaluate			
Create			

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	
Understand	
Apply	20
Analyze	20
Evaluate	10
Create	

FOURTH SEMESTER SYLLABUS

New Horizon College of Engineering
Department of Mechanical Engineering

APPLIED MATHEMATICS – IV

Course Code	21MEE41A		Credits	03
L: T: P:S	3:0 :0:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE41A.1	Solve initial value problems using appropriate numerical methods
21MEE41A.2	Learn the concepts of Complex variables and transformation for solving Engineering Problems
21MEE41A .3	Know the concepts of complex integration and its applications in the stability analysis of engineering problems
21MEE41A.4	Gain ability to use probability distributions to analyze and solve real time problems
21MEE41A.5	Apply the concept of sampling distribution to solve engineering problems
21MEE41A.6	Use the concepts to analyze the data to make decision about the hypothesis

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE41A.1	3	3	3	3	3		1				3	3		
21MEE41A.2		3			3						3	3		
21MEE41A .3		3			3						3	3		
21MEE41A.4	3	3	3	3	3	2			3	3	3	3		
21MEE41A.5	3	3	3	3	3					3	3	3		
21MEE41A.6	3	3	3	3	3					3	3	3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491

REFERENCE BOOKS:
1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd. Ninth Edition, 2014, ISBN: 9788131808320.

New Horizon College of Engineering

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Syllabus

Module No	Module Contents	Hrs	COs
1	**Numerical Methods:** Numerical solution of ordinary differential equations of first order and of first degree: Taylor's series method, Modified Euler's method and Runge-Kutta method of fourth-order-Problems. Milne's predictor and corrector methods-Problems. Numerical Solutions of second order ordinary differential equations by Runge-Kutta method of fourth-order-Problems. Case studies on Numerical Analysis.	9	21MEE41A.1
2	**Complex Variables:** Functions of complex variables, Analytical functions, Cauchy-Riemann Equations in Cartesian and Polar forms, Harmonic functions and Construction of analytic functions-Problems using Milne-Thompson's method. **Applications:** Flow Problems-Velocity potential, Stream functions and complex potential functions.	9	21MEE41A.2
3	**Conformal Transformations and Complex Integrations:** $w = z$ and $w = e^Z$. Cauchy's Theorem (with proof), Generalized Cauchy's integral formula, Singularities, Poles and Residues, Residue theorem (without proof)-Problems.	9	21MEE41A.3
4	**Probability distributions:** Random variables (discrete and continuous), probability density functions, moment generating function. Discrete Probability distributions: Binomial and Poisson Distributions-Problems. Continuous Probability distributions: Exponential and Normal Distributions-Problems. Case Studies on Distributions.	9	21MEE41A.4
5	**Sampling Theory:** Sampling, Sampling distributions, standard error, test of hypothesis of large samples for means and proportions, Inferences for variance and proportion. Central limit theorem (without proof), confidence limits for means, Student's t-distribution, F-distribution and Chi-square distribution for test of goodness of fit for small samples. Case Studies on sampling theory and significant measures of scores.	9	21MEE41A.5, 21MEE41A.6

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Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	5	
Understand	5	5	
Apply	10	5	10
Analyze	2.5		
Evaluate	2.5		
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	

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LIFE SKILLS FOR ENGINEERS

Course Code	21HSS421A		Credits	02
L: T: P:S	1:0:1:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21HSS421A.1	Relate "SMART GOALS" to personal and professional life
21HSS421A.2	Articulate and communicate ideas and thoughts with clarity and focus
21HSS421A.3	Develop critical and creative thinking skills for problem solving and decision making for leadership.
21HSS421A.4	Analyze the importance of the concepts of personality development and grooming in corporate life
21HSS421A.5	Determine personal and professional responsibility by using ownership task bar

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS421A.1								3	3	3	3	3		
21HSS421A.2						3	3	3	3	1	3	3		
21HSS421A.3						3	3	3	3	3	2	3		
21HSS421A.4							3	3	3	3	2	3		
21HSS421A.5						3	2	3	3	2	3	3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

REFERENCE BOOKS:
1) The 7 – Habits of Highly Effective People, Stephen R Covey, Neha Publishers.
2) Seven Habits of Highly Effective Teens, Convey Sean, New York, Fireside Publishers, 1998.
3) Emotional Intelligence, Daniel Coleman, Bantam Book, 2006.
4) How to win friends and influence people, Dale Carnegie
5) BHAGAVDGITA for college students   Sandeepa Guntreddy

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Syllabus

Module No	Module Contents	Hrs	COs
1	**Goal Setting**: Importance of Goals: Achiever's goal - Creating SMART for personal and professional life, Right action at right time, career planning, overcoming fear and face uncertainty, Mind Mapping. Communication – Intellectual preparation/Idea generation.	6	**21HSS421A.1 21HSS421A.2**
2	**You are the creator** - Taking Ownership, Being Responsible and Accountable. Meaning of Ownership, Responsibility and Accountability, Practicing these philosophies in course, career. Social responsibility. Communication – Organizing thought flow.	6	**21HSS421A.2 21HSS421A.5**
3	**Self-Awareness and Self-Management**: Emotional Intelligence, Know yourself- understanding personality, perception, techniques to understand self – Johari window and SWOT, reason for fall and opportunities to grow. Individual behaviour, attitude towards change and work, being proactive and positive. Interpersonal skills - Knowing others, working well with others. Communication – Structured articulation	9	**21HSS421A.2 21HSS421A.5**
4	**Leadership**: meaning, self- motivation, coming out of comfort zone, mental preparation - accepting failure and resilience, decision making, thinking skills – critical and creative, six thinking hats, watchfulness - proactive risk management, problem solving mind set .Communication – Tips for Jam session, GD and Presentation	9	**21HSS421A.2 21HSS421A.3**
5	**Personality Development and Grooming**: - Expectations from the industry, building personal presence, corporate grooming, corporate etiquettes, Personal branding and image management. Communication – Mock GD sessions	6	**21HSS421A.2 21HSS421A.4**

Assessment Pattern

CIE (50 Marks – Theory)

SEE (50 Marks – Theory)

NOTE: Being a Life skills course we felt it would be suitable to do the final assessment through a structured group discussion which will provide an opportunity to test students in all levels of Bloom's Taxonomy.

Bloom's Category	Tests	Assign ments	Self Study	Peer Evaluation
Marks	**10**	**15**	**15**	**10**
Remember				
Understand				
Apply	5	5		5
Analyze			5	
Evaluate				
Create	5	10	10	5

Bloom's Category	Group Discussion
Remember	5
Understand	10
Apply	10
Analyze	10
Evaluate	5
Create	10

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ENTREPRENEURSHIP DEVELOPMENT- 2

Course Code	21HSS431A		Credits	01
L: T: P: S	1:0:0:0		CIE Marks	50
Exams Hours	02		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21HSS431A.1	Identify the problem and understand the concept of blue ocean strategy
21HSS431A.2	Create Minimum viable product
221HSS431A.3	Analyze customer segment, Niche and early adopters
21HSS431A.4	Interpret the cost revenue Structure and feasibility of the venture
21HSS431A.5	Analyze and develop financial model for venture.
21HSS431A.6	Create sustainable venture through step wise process (problem solution fit, MVP and financial model).

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS431A.1		3				3	1	2				1		
21HSS431A.2		3				3	1	2						
21HSS431A.3		3				3	1	2						
21HSS431A.4		3		3		3	1	2				3		
21HSS431A.5		3		3		3	1	2				3		
21HSS431A.6		3		3		3	1	2				3		

SUGGESTED CASE STUDIES :
1. Kent RO water purifier business idea case study | Business
2. Kent RO water purifier business idea case study | Business Idea from Children - YouTube
3. Red Bus Start up story Phanindra Sama: The RedBus journey - YouTube

BOOKS FOR REFERENCE
1. Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant – Illustrated, 10 February 2015,by Kim (Author)
2. Financial Modeling, fourth edition (The MIT Press) , Illustrated, 18 April 2014,by Simon Benninga
3. Positioning: The Battle for Your Mind, by Al Ries, Jack Trout

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Module No	Module Contents	Hrs	COs
1	**Refining Problem and solution** Identify and refining the problem, Brainstorming Solutions, Problem-Solution Fit	**3**	**21HSS431A.1**
2	**Blue ocean strategy** – Meaning, concept, Implementation	3	**21HSS431A.2**
3	**Minimum Viable Product**- Meaning of MVP, ways to Build an MVP, Present Your MVP	**3**	**21HSS431A.3**
4	**Business Model** - Cost Revenues and Pricing- concept, Business model- Lean Canvas – components, implementation	**3**	**21HSS431A.4**
5	**Financing and Financial Model** - Bootstrapping meaning and concept and Initial Financing, Financial Model- concept and implementation	**3**	**21HSS431A.5 , 21HSS431A.6**

INTERNAL ASSESSMENT PATTERN – 50 Marks

Assessment format	Weightage to be awarded	Comments
Quiz	20 Marks	To be administered as a part of CI
Venture Milestone	30 Marks	Student should create VM 1, VM2, VM3

- VM1- Presentation- Forming team, Identifying problem, identifying solution (Module 1& 2)
- VM2- Presentation- Validate solution Identify customer segment, and early adopter, Create value proposition canvas ,(Module-3 & 4)
- VM3- Presentation -Create business plan using lean canvas (Module-5)

SEE- Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	10
Apply	10
Analyze	5
Evaluate	5
Create	10

New Horizon College of Engineering

Department of Mechanical Engineering

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Course Code	21HSS441A
L: T: P: S	1:0:0:0
Exams Hours	02

Credits	01
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21HSS441A.1	Gain knowledge of Indian Constitution and be able to solve the legal and societal issues.
21HSS441A.2	Understand the powers and functions of the Union, State and Local Governments in detail.
21HSS441A.3	Understand Electoral Process, Emergency provisions and Amendment procedure.
21HSS441A.4	Acquire the knowledge of their Ethical Duties, Responsibilities and the decision making Ability.
21HSS441A.5	Understand the cybercrimes and cyber laws for cyber safety measures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21HSS441A.1						1		3	1			3		
21HSS441A.2						1		3	1			3		
21HSS441A.3						1		3	1			3		
21HSS441A.4						1		3	1			3		
21HSS441A.5						1		3	1			3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1. Durga Das Basu: "Introduction to the constitution"19th/20th Edn., or 2008, Lexis Nexis; Twentieth edition (2011)
2. Shubham Singles, Charles E.Haries :Constitution of India and Professional Ethics.Latest Edition-2018, Cengage Learning India Private Limited (2019)
3. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018 Reference Books

REFERENCE BOOKS:

1. M.Govindarajan, Natarajan, V.S.Senthilkumar, Engineering Ethics", Prentice Hall India Learning Private Limited (2013)
2.M.V.Pylee,"An Introduction to Constitution of India", Vikas Publishing 2002.
3.Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018 Reference Books

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Module No	Module Contents	Hrs	COs
1	**Introduction To Constitution Of India** Introduction to Constitution of India. The making and salient features of the constitution. The necessity of the constitution. The Role of the Constituent Assembly- Preamble to Indian constitution. Fundamental rights and its restrictions and Limitations. Decided case studies .Directive principles of state policy. Fundamental Duties and its Scope and significance in Nation building.	**3**	**CO1**
2	**Union Executive And State Executive** Union Executive - President, prime minister, parliament and supreme court of India. Judicial activism and judicial review. Important parliamentary terminology. Center- state relations. Attorney General of India, Comptroller and Auditor General of India. State Executive- Governor, Chief Minister, State Legislature. High Court and Subordinate Court. Advocate General of the State .Controller and Auditor General of State. Special Provisions (Articles 370.371,371J) for some States	3	**CO2**
3	**Amendments and Procedure, Elections and Emergency Provisions:** Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments – Types and Important Constitutional Amendments.Amendments-42,44,61,86,73,74,91,95,100,101,118. Emergency Provisions, types of Emergencies and its effects. special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.	**3**	**CO3**
4	**Engineering Ethics:** Scope & aim of engineering ethics. Responsibility of engineers, Impediments to responsibility. Clash of ethics. Risk, safety and liability of Engineers. Trust and reliability in Engineering. IPR (Intellectual Property Right).Corporate Ethics.	**3**	**CO4**
5	**Internet Laws, Cyber Crimes and Cyber Laws:** Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types and causes for Cyber Crimes, Cyber Crimes land mark judgements in India and the information Technology Act 2000, Cybercrimes and enforcement agencies.	**3**	**CO5**

Assessment Pattern

CIE (50 Marks)

Bloom's Category	Tests	Assignments	
Marks	**25**	**25**	
Remember	10	10	
Understand	10	10	
Apply	05	05	
Analyze			
Evaluate			
Create			

SEE (50 Marks)

Bloom's Category	Tests (theory)
Remember	20
Understand	20
Apply	10
Analyze	
Evaluate	
Create	

New Horizon College of Engineering
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ENGINEERING THERMODYNAMICS

Course Code	21MEE45A
L: T: P:S	3:0 :0:0
Exams Hours	03

Credits	03
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE45A.1	Understand the basic concepts of thermodynamics like systems, equilibrium, process etc and its applications
21MEE45A.2	Identify the different types of work and heat transfer mechanisms.
21MEE45A .3	Apply the laws of thermodynamics to real system.
21MEE45A.4	Distinguish reversible and irreversible process using second law and entropy concepts
21MEE45A.5	Apply the theoretical knowledge of internal combustion engines to determine the performance characteristics and draw heat balance sheet of petrol and diesel engines.
21MEE45A.6	Evaluate the performance of air standard cycles, vapor power cycles and Refrigeration cycles

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE45A.1	3													
21MEE45A.2	3	3												3
21MEE45A.3		3	3				1							3
21MEE45A.4	3													3
21MEE45A.5	3	3	3	1										3
21MEE45A.6	3	3					1					1		3

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Engineering Thermodynamics, P.K.Nag, Tata McGraw Hill Publication, 6th edition, 2017, ISBN: 9789352606429.
2) Engineering Thermodynamics, R.K Rajput, Lakshmi Publications, 2019, ISBN 9788131800584.

REFERENCE BOOKS:
1) Fundamentals of Engineering Thermodynamics, Moran J Shapiro., John wiley 8th edition, 2015, ISBN – 9780470032091.
2) Thermodynamics, An Engineering Approach, YunusA.Cenegal and Michael A.Boles, Tata McGraw Hill publications,9th edition 2019, ISBN - 9953165741
3) Fundamentals of Thermodynamics, Claus Borgnakke, Richard Edwin Sonntag,wiley india edition, 2020,WILEY, ISBN – 9788126598199

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Module No	Module Contents	Hrs	COs
1	**Fundamental Concepts & Definitions**: Thermodynamics: definition cyclic and non-cyclic processes Thermodynamic equilibrium: definition and conditions, Zeroth law of thermodynamics: Statement, and significance. Temperature concepts: two point scales and one-point scale, Numerical on temperature scales	9	**21MEE45A.1 21MEE45A .3**
2	**Work and Heat**: Mechanics definition of work and its limitations. Thermodynamic definition of work; examples, sign convention. Displacement work explanation, expressions for displacement work in various processes through p-V diagrams, Problems on work transfer and heat transfer. **First Law of Thermodynamics**: Joules experiment, Statement of the First law of thermodynamics, steady state-steady flow energy equation, Assumptions for SFEE and some important applications. Numerical on open and closed systems	9	**21MEE45A.2 21MEE45A .3**
3	**Second Law of Thermodynamics**: Thermal reservoirs. Direct heat engine; schematic representation and efficiency. Reversed heat engine, schematic representation, coefficients of performance. Kelvin - Planck and Clausius statement of the Second law of Thermodynamics; Equivalence of the two statements, Numericals **Entropy:** Clausius theorem, Clausius inequality; Statement, proof, application to a reversible cycle. Entropy; definition, a property, change of entropy for irreversible process, principle of increase in entropy of the universe, Numerical	9	**21MEE45A .3 21MEE45A .4**
4	**RECIPROCATING INTERNAL COMBUSTION ENGINES**: Concepts of Four-stroke & Two -stroke Engine and valve timing diagram, Measurement of air and fuel flow rates, Engine output and efficiency, Engine performance characteristics, problems on Morse test and Heat Balance Sheet. Case studies on Superchargers and Turbochargers	9	**21MEE45A .5**
5	**Heat Power Cycles**: Carnot, Otto, Diesel, Dual, Rankine, Brayton cycles (Derivation on efficiencies of the cycles and Numericals) **Refrigeration cycles and Air Conditioning**: Reversed Carnot, Bell Coleman cycle, Vapour compression cycles (Expression for COP of the cycles and Numericals). Summer and winter air conditioning.	9	**21MEE45A .6**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5		
Understand	5	5	5
Apply	5	5	5
Analyze	5	5	
Evaluate	5		
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	10
Understand	20
Apply	10
Analyze	5
Evaluate	5
Create	

New Horizon College of Engineering

Department of Mechanical Engineering

ENGINEERING THERMODYNAMICS LAB

Course Code	21MEL45A
L: T: P:S	0:0:1:0
Exams Hours	03

Credits	01
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL45A.1	Conduct tests to determine the properties of fuels and oils
21MEL45A.2	Investigate performance tests on IC engines and draw characteristics plots
21MEL45A.3	Analyze the area of irregular and regular surfaces using planimeter
21MEL45A.4	Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL45A.1	3	3											3	
21MEL45A.2	3	3	3	3			3						3	
21MEL45A.3	3	3											3	
21MEL45A.4	3	3	3	3			3						3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) Engineering Thermodynamics, P.K.Nag, Tata McGraw Hill Publication, 6th edition, 2017, ISBN: 9789352606429.
2) Engineering Thermodynamics, R.K Rajput, Lakshmi Publications , 2019, ISBN 9788131800584.

REFERENCE BOOKS:

1) Fundamentals of Engineering Thermodynamics, Moran J Shapiro., John wiley 8th edition, 2015, ISBN – 9780470032091.
2) Thermodynamics, An Engineering Approach, YunusA.Cenegal and Michael A.Boles, Tata McGraw Hill publications,9th edition 2019, ISBN - 9953165741
3) Fundamentals of Thermodynamics, Claus Borgnakke, Richard Edwin Sonntag,wiley india edition, 2020,WILEY, ISBN – 9788126598199

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Syllabus

Exp. No.	Contents of Experiment	Hrs	COs
1	Valve Timing diagram of a 4 stroke I.C. engine	2	21MEL45A.2
2	Port opening Timing diagram of a 2 stroke I.C. engine	2	21MEL45A.2
3	Performance Tests on I.C. Engines (multi cylinder diesel), Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio. Calculations using software tools.	2	21MEL45A.2
4	Heat balance sheet and Morse test for Four Stroke Diesel Engine.	2	21MEL45A.2
5	flash point and fire point using open cup apparatus	2	21MEL45A.1
6	flash point and fire point using closed cup apparatus	2	21MEL45A.1
7	Determination of area of irregular surface using Planimeter,	2	21MEL45A.3
8	Performance Tests on I.C. Engines, (single cylinder diesel), Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio for Four stroke Diesel Engine, calculations using software tools.	2	21MEL45A.2
9	Determination of Calorific value of solid and liquid fuels	2	21MEL45A.1
10	Determination of Calorific value of gaseous fuels	2	21MEL45A.1
11	Performance Test on a Vapour Compression Refrigeration	2	21MEL45A.4
12	Performance Test on a Vapour Compression Air – Conditioner	2	21MEL45A.4

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	20	20	10
Remember			2
Understand		5	2
Apply		5	2
Analyze	10	5	2
Evaluate	10	5	2
Create			

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

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MANUFACTURING TECHNOLOGY

Course Code	21MEE46A
L: T: P:S	3:0:0:0
Exams Hours	03

Credits	03
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE46A.1	Design the manufacturing process, selecting the suitable moulding and casting processes
21MEE46A.2	Emphasize various concepts of forging and joining techniques for required materials.
21MEE46A.3	Analyze the tool life and tool failure during machining process
21MEE46A.4	Decide the appropriate machine tools to manufacture the components
21MEE46A.5	Apply various machining operations suitable to manufacture specific components.
21MEE46A.6	Investigate on special Moulding processes & Machines

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE46A.1	3	3												3
21MEE46A.2	3													3
21MEE46A.3	3	3												3
21MEE46A.4	3	3											2	
21MEE46A.5	3	3											2	3
21MEE46A.6	3	3											2	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Manufacturing Process-I, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2017.ISBN:978-8128002076
2) Manufacturing & Technology: Foundry Forming and Welding", P.N.Rao,Volume1.Tata McGraw Hill Education Private Limited, 2018, ISBN 13:978- 9353160517
3) Principles of metal casting, R.W Heine, C.R. Loyer, McGraw Hills Pvt limited ,2017 ISBN:978-0070993488

REFERENCE BOOKS:
1) Process and Materials of Manufacturing, Roy A Lindberg, Pearson Edu, 4thEd. 2015, ISBN-13:978- 9332556973.
2) Manufacturing Technology, Serope Kalpakjian, Steven. R.Schmid, Pearson Education Asia, 7thEd. 2018, ISBN -13:978-9810694067.
3) Manufacturing Process-III, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2018,ISBN:9788128010439

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Module No	Module Contents	Hrs	COs
1	**Casting by Moulding sand**: Introduction to Casting process & steps involved. Mixture ingredients for different sand mixtures. Method used for sand moulding, such as Greensand, dry sand and skin dried moulds. **Patterns & Cores**: Definition, Need, Types, Material. Method of making patterns, cores, Binders & additives used in sand moulding. Concept of Gating &Risers: Principle and types. **Casting defects**: Types & methods to avoid **Case Study**: Make a typical pattern by suitable software supported tool.	8	21MEE46A.1
2	**Special moulding Process**: Study of important moulding processes, No bake moulds, Flask less moulds, Sweep mould, CO_2 mould, Shell mould, Investment mould. Metal moulds: Gravity die-casting, Pressure die casting, Centrifugal casting, Squeeze Casting, Slush casting, Thixo-casting and Continuous Casting Processes. Moulding Machines: Jolt type, Squeeze type, Jolt & Squeeze type and Sand slinger, classifications of Melting Furnaces. **Case Study**: Make a typical Sand/Metal mould by suitable moulding machine.	10	21MEE46A.6
3	**Theory of metal cutting**: Single point cutting tool nomenclature, types of metal cutting, Mechanism of chip formation, types of chips. Tool wear and tool failure, tool life. Effects of cutting parameters on tool life. Tool failure criteria, Taylors tool life equations, numericals on tool life. **Turning (lathe)**: classifications, Work holding devices, constructional features of turret and capstan lathe, tool layout. **Milling machines**: classification, constructional features, milling cutters nomenclature, milling operations, up milling and down milling concept. Various milling operations, Indexing: simple, compound, differential and angular indexing calculations **Drilling machine**: classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials, reaming, boring, tapping **Case Study**: Make a typical work piece using all the Computer Numerical Controlled machining processes.	12	21MEE46A.3 21MEE46A.4 21MEE46A.5
4	**Welding process**: Principle of welding, classification, application advantages and disadvantages, welding terminology, edge preparation. **Arc welding**: Arc welding process, Metal arc welding(MAW) or Flux shielded metal arc welding(FSMAW), Tungsten inert gas welding(TIG), Metal inert gas welding(MIG), Submerged arc welding(SAW), Atomic hydrogen welding(AHW). **Soldering and Brazing**: Surface cleaning and soldering flux, Types of soldering, advantages and disadvantages, types of brazing, advantages and disadvantages. **Case Study**: Make a typical special welded/brazed model by suitable welding/brazing process.	8	21MEE46A.2

	New Horizon College of Engineering		
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5	**Forging**: Introduction, Classification of forging processes. Forging machines & equipment. Forging pressure and load in open die forging and closed die forging, concepts of friction hill and factors affecting it. Die- design parameters. Material flow lines in forging. Forging defects, Residual stresses in forging. Advantages and disadvantages of forging. Simple problems. **Case Study**: Make a typical die forged model by suitable die forging process.	**7**	**21MEE46A.2**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5		
Understand	5	5	5
Apply	5	5	5
Analyze	5	5	
Evaluate	5		
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	10
Understand	20
Apply	10
Analyze	5
Evaluate	5
Create	

New Horizon College of Engineering

Department of Mechanical Engineering

MANUFACTURING TECHNOLOGY LAB

Course Code	21MEL46A
L: T: P:S	0:0:1:0
Exams Hours	03

Credits	01
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL46A.1	Analyze the properties of sand by determining various values from the sand tests and develop the skill towards metal joining techniques
21MEL46A.2	Utilize the patterns of different geometrical shapes for mold making and volumetric calculation in forging processes
21MEL46A.3	Prepare various models of turning, Knurling, facing and step turning operations using lathe, Analyze the methods of taper turning, thread cutting and preparing models using the same
21MEL46A.4	Drill the holes and grind the work pieces into the required contour using drilling and grinding machines, Develop Models to Cut grooves using milling

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL46A.1	3	3	3					3	3	3			3	3
21MEL46A.2	3	3	3					3	3	3				3
21MEL46A.3	3	3	3		2			3	3	3			3	
21MEL46A.4	3	3	3		2			3	3	3			3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Manufacturing Process-I, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2017. ISBN:978-8128002076
2) Manufacturing & Technology: Foundry Forming and Welding", P.N.Rao,Volume1.Tata McGraw Hill Education Private Limited, 2018, ISBN 13:978- 9353160517
3) Principles of metal casting, R.W Heine, C.R. Loyer, McGraw Hills Pvt limited ,2017 ISBN:978- 0070993488
4) Hazara Choudhry, 'Work shop Technology', Vol – II, Media promoters and publishers Pvt. Ltd. 2018, ISBN:9788185099156
5) R.K.Jain, 'Production Technology', Khanna Publishers-Delhi , 2017, ISBN:9788174090997

REFERENCE BOOKS:
1) Process and Materials of Manufacturing, Roy A Lindberg, Pearson Edu, 4thEd. 2015, ISBN- 13:978- 9332556973.
2) Manufacturing Technology, Serope Kalpakjian, Steven. R.Schmid, Pearson Education Asia, 7th Ed. 2018, ISBN -13:978-9810694067.
3) Manufacturing Process-III, Dr.K.Radhakrishna, Sapna Book House, 5th Revised Edition 2018, ISBN:9788128010439

New Horizon College of Engineering

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4) G.Boothroyd , 'Fundamentals of Metal machining and machine tools', McGraw Hill, 2015, ISBN:978- 1574446593

5) HMT, 'Production Technology', HMT, Tata McGraw Hill, 2017. ISBN:978-0070964433

6)Henrich Gerling, Karl H Heller, 'All about machine tools', 2nd Edition, New Age publishers, 2016,ISBN: 9780852263105

7)P. N. Rao, ' Manufacturing Technology', Vol I & II, 4th edition, Tata McGraw Hill publication, New Delhi, 2018, ISBN: 978-1259029561

Syllabus

Exp. No.	Contents of Experiment	Hrs	COs
1	**Foundry Models**: Model 1- Preparation of moulds using two moulding boxes with pattern	2	**21MEL46A.2**
2	Model 2- Preparation of moulds using two moulding boxes without pattern	2	**21MEL46A.2**
3	Permeability test and Sieve analysis test	2	**21MEL46A.1**
4	Clay content test and Moisture content test	2	**21MEL46A.1**
5	**Forging Models**: Model 1- Converting round rod to square rod	2	**21MEL46A.2**
6	**Joining Models**: Model 1- Soldering, Model 2- Brazing, Model 3- Electric Arc & gas welding	2	**21MEL46A.1**
7	Preparation of models on lathe involving facing, plain turning, step turning, taper turning, knurling and thread cutting.	2	**21MEL46A.3**
8	Cutting of v groove/ dovetail/ rectangular groove/gear teeth using milling/Shaping	2	**21MEL46A.4**
9	Preparation of models on drilling involving reaming, boring andinternal thread cutting.	2	**21MEL46A.4**
10	Grinding of a surface using a surface grinding machine	2	**21MEL46A.4**
11	Demonstration of melting, pouring for casting and CNC turning and milling centres	2	**21MEL46A.2, 21MEL46A.3**

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	**20**	**20**	**10**
Remember	4	4	2
Understand	4	4	2
Apply	4	8	2
Analyze	4	4	2
Evaluate	4		2
Create			

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

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MATERIAL SCIENCE AND METALLURGY

Course Code	21MEE47A		Credits	03
L: T: P:S	3:0:0:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEE47A.1	Identify the properties of metals with respect to crystal structure and grain size.
21MEE47A.2	Explain the concept of Phase diagram & understand the Construction and identification of phase diagrams and reactions
21MEE47A.3	Understand invariant reactions and various Equilibrium diagrams. Introduce the concept of hardenability & demonstrate the test used to find hardenability of steels.
21MEE47A.4	Recommend the suitable type of Heat treatment which helps in various applications and Significance of properties Vs microstructure.
21MEE47A.5	Distinguish different types of cast irons, steels and nonferrous alloy for specific applications
21MEE47A.6	Apply the concept of powder metallurgy in manufacturing process; understand the manufacturing processes of different types of Ceramics.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21MEE47A.1	3	3	3	-	-	-	3	-	-	-	-	3	3	
21MEE47A.2	3	3	3	-	-	-	3	-	-	-	-	3	3	
21MEE47A.3	3	3	3	-	-	-	3	-	-	-	-	3	3	
21MEE47A.4	3	3	3	-	-	-	3	-	-	-	-	3	3	
21MEE47A.5	3	3	3	-	-	-	3	-	-	-	-	3	3	
21MEE47A.6	3	3	3	-	-	-	3	-	-	-	-	3	3	

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

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TEXT BOOKS:

1."Introduction to Physical Metallurgy" Sidney H Avner, Mcgraw Hill Education, 1997,ISBN 13: 9780074

2.Fundamentals of Material Science and Engineering" David G Rethwisch William D Callister Jr. Ret Callister , John Wiley & Sons Publishers, 4th Edition, 2012, ISNB13: 978111806160

REFERENCE BOOKS:

. 1."Materials Science and Engineering", V.RAGHAVAN, PHI Learning, 2004, ISBN: 9788120324558

2."Engineering Materials", Kenneth G. Budinski, Michael K. Budinski, Prentice Hall, 9 edition, 2010, ISBN: 978013712842

Syllabus

Module No	Module Contents	Hrs	COs
1	**Crystal Structure :**BCC, FCC and HCP Structures, coordination number and atomic packing factors, Derivation of APF for BCC,FCC & HCP structures, crystal imperfections - point line and surface imperfections. Simple problems. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion. Simple problems.	9	**21MEE47A.1**
2	**Phase Diagram I:** Solid solutions, Hume Rothary rule, substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule. **Phase Diagram II:** Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Different types invariant reactions – Eutectic, Eutectoid, Peritectic, Peritectectoid reactions	9	**21MEE47A.2**
3	**Iron carbon equilibrium diagram**: Description of phases, solidification of steels and cast irons, invariant reactions. Heat treating of metals TTT curves, continuous cooling curves, description of the following heat treatment processes with industrial applications: annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, Flame hardening, induction hardening.	9	**21MEE47A.3 21MEE47A.4**
4	**Engineering materials**: Properties, Composition and Applications of Grey cast iron, White cast Iron, malleable iron, SG iron and steels, Copper & Aluminium alloys. Titanium and Magnesium alloys. **Nanomaterials:** History of nanomaterials; Synthesis of nanomaterials-physical nanofabrication techniques (PVD, MBE, CVD, self-assembly, lithographic techniques) Applications of nanomaterials- Application of nanomaterials in healthcare, biosenors, coatings environment, catalysis, agriculture, automotives, sensors, electronics, photonics, information technology, quantum computing, energy and aerospace sector.	9	**21MEE47A.5**

5	**New Horizon College of Engineering** **Department of Mechanical Engineering** **Ceramics**: Introduction to ceramics, nature of ceramics, types of ceramics, properties of ceramics materials, ceramic forming techniques, applications of ceramics. **Powder Metallurgy**: Definition and concept, applications, powder metallurgy process, Production of metal powders, characteristics of metal powders, compacting, pre sintering and sintering.	9	**21MEE47A.6**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	4		
Understand	4		
Apply	6	3	5
Analyze	8	7	5
Evaluate	3	5	
Create			

SEE (50 Marks – Theory)

Bloom's Category	Tests (theory)
Remember	8
Understand	7
Apply	15
Analyze	15
Evaluate	5
Create	

New Horizon College of Engineering
Department of Mechanical Engineering

SIMULATION LAB

Course Code	21MEL47A		Credits	01
L: T: P:S	0:0:1:0		CIE Marks	50
Exams Hours	03		SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21MEL47A.1	Solve mathematical operations using programming language
21MEL47A.2	Plot and analyze mathematical equations
21MEL47A.3	Solve engineering problems using computational methods
21MEL47A.4	Analyze engineering problems using simulation

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
21MEL47A.1	3	3			3									3
21MEL47A.2	3	3	3	3	3									3
21MEL47A.3	3	3	3	3	3									3
21MEL47A.4	3	3	3	3	3									3

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1)"MATLAB for Engineers" - Holly Moore, Pearson Education Inc, 2018, ISBN: 978-0-13-458964-0
2)"MATLAB® An Introduction with Applications" - Amos Gilat, John Wiley & Sons, Inc., 2016, ISBN: 978-1-119-25683-0

REFERENCE BOOKS:

1) "MATLAB: An Introduction with Applications" –Rao V Dukkipati, Anshan Ltd, 1st edition, 2010, ISBN: 9781848290433
2) "Programming with MATLAB for Scientists: A Beginner's Introduction" -E. Mikhailov Eugeniy (Author), CRC Press, 2018, ISBN: 978-1138570047

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Department of Mechanical Engineering

Exp. No.	Contents of Experiment	Hrs	COs
1	Basic operations on vectors and matrices	2	**21MEL47A.1**
2	Solve system of linear equations	2	**21MEL47A.1**
3	Solve integration and differentiation problems using computational platforms	2	**21MEL47A.1**
4	Perform computational analysis using 2D plots	2	**21MEL47A.2**
5	Perform computational analysis using 3D plots	2	**21MEL47A.2**
6	Solve system of linear algebraic equations using numerical methods	2	**21MEL47A.3**
7	Analyze friction acting on different bodies using computational platforms	2	**21MEL47A.3**
8	Determine forces on members of truss using computational platforms	2	**21MEL47A.3**
9	Solve equation of airfoil and analyze piston rod crank mechanism	2	**21MEL47A.3**
10	Analyze different vibration problems and analyze forces on a body	2	**21MEL47A.3**
11	Use Simulink to solve differential equation	2	**21MEL47A.4**
12	Use Simulink to solve mechanical systems	2	**21MEL47A.4**

Assessment Pattern

CIE (50 Marks – Lab)

Bloom's Category	Experiments / Tests	Record	Viva
Marks	**20**	**20**	**10**
Remember			2
Understand			2
Apply			2
Analyze	10	8	2
Evaluate	10	8	2
Create		4	

SEE (50 Marks – Lab)

Bloom's Category	Test
Remember	4
Understand	4
Apply	2
Analyze	20
Evaluate	20
Create	

New Horizon College of Engineering
Department of Mechanical Engineering

BASIC APPLIED MATHEMATICS-I

Course Code	21DMAT31A
L: T: P: S	0:0:0:0
Exams Hours	02

Credits	00
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21DMAT31A.1	Know the principles of engineering mathematics through calculus
21DMAT31A.2	Determine the power series expansion of a function
21DMAT31A.3	Find the definite integrals with standard limits and also develop the ability to solve different types of differential equations
21DMAT31A.4	Apply ideas from linear algebra in solving systems of linear equations and determine the Eigen values and Eigen vectors of a matrix

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21DMAT31A.1	3	3	3									3		
21DMAT31A.2	3	3	3									3		
21DMAT31A.3	3	3	3									3		
21DMAT31A.4	3	3	3									3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

REFERENCE BOOKS:

1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Module No	Module Contents	Hrs	COs
1	**Differential Calculus**: Polar Curves-Problems on angle between the radius vector and tangent, Angle between two curves-Problems, Pedal equation for polar curves Problems. Maclaurin's theorem for function of one variable (statement only)-Problems.	5	**21DMAT31A.1, 21DMAT31A.2**
2	**Partial differentiation:** Definition and Simple problems, Euler's theorem for Homogeneous function (No Derivation and NO extended theorem)-Problems. Jacobians of order two - definition and problems.	5	**21DMAT31A.1**
3	**Integral Calculus and Differential Equations:** Problems on evaluation of sin n x and cos n x integrals with standard limits (0 to $\pi/2$). Solution of first order and first-degree differential equations-Variable separable, Linear and Exact differential equations.	5	**21DMAT31A.3**
4	**Linear Algebra-1:** Problems on rank of a matrix by elementary transformations, Solution of system of linear equations by Gauss elimination method-Problems.	5	**21DMAT31A.4**
5	**Linear Algebra-2:** Linear transformation, Eigen values and Eigen Vectors of a square matrix-Problems..	5	**21DMAT31A.4**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	5	
Understand	5	5	
Apply	10	5	10
Analyze	2.5		
Evaluate	2.5		
Create			

SEE (50 Marks – Theory/Lab)

Bloom's Category	Tests (theory)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	

New Horizon College of Engineering
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BASIC APPLIED MATHEMATICS-II

Course Code	21DMAT41A
L: T: P: S	0:0:0:0
Exams Hours	02

Credits	00
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21DMAT41A.1	Gain knowledge of basic operations of vectors
21DMAT41A.2	Use curl and divergence of a vector function in three dimensions
21DMAT41A.3	Develop the ability to solve higher order Linear differential equations
21DMAT41A.4	Know the basic concepts of Laplace transform to solve the Periodic functions and also solve initial and boundary value problems using Laplace transform method

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21DMAT41A.1	3	3	3	3	-	-	-	-	-	-	3	3		
21DMAT41A.2	3	3	3	3	-	1	-	-	-	-	3	3		
21DMAT41A.3	3	3	3	3	3	-	3	-	-	3	3	3		
21DMAT41A.4	3	3	3	3	3	-	3	-	-	3	3	3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:

1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, Tenth Edition, 2014, ISBN: 9788126554232.
2) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Forty fourth Edition, 2022, ISBN: 9788193328491.

REFERENCE BOOKS:

1) Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, Fourth Edition, 2015, ISBN: 9780273719236.
2) B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, Fourth Edition, 2017, ISBN: 9780070634190.
3) H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., Twenty Second Edition, 2018, ISBN: 9789352533831.
4) N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., Ninth Edition, 2014, ISBN: 9788131808320.

New Horizon College of Engineering

Department of Mechanical Engineering

Syllabus

Module No	Module Contents	Hrs	COs
1	**Vectors:** Definition of scalar and vector, Vector addition, Subtraction and Multiplication-Dot product, Cross produc[t] Scalar triple product. Orthogonal, Co-planar and Angle between vectors-Problems.	5	**21DMAT41A.1**
2	**Vector Differentiation:** Vector differential operator-Gradient of a scalar function, Divergence of a vector function, Curl of a vector function-Problems. Solenoidal and irrotational vector fields-Problems.	5	**21DMAT41A.2**
3	**Linear differential equations with constant coefficients:** Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax}, $\mathrm{Sin}\,(ax+b)$ and $\mathrm{Cos}\,(ax+b).$	5	**21DMAT41A.3**
4	**Laplace Transform:** Definition and Laplace transforms of elementary functions-Problems. Properties of Laplace transforms (Shifting property-without proof), Periodic functions (without proof)-problems	5	**21DMAT41A.4**
5	**Inverse Laplace Transform**: Inverse Laplace Transform partial fractions-Problems. Solution of linear different[ial] equations using Laplace Transforms-Problems.	5	**21DMAT41A.4**

Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests	Assignments	Quizzes
Marks	**25**	**15**	**10**
Remember	5	5	
Understand	5	5	
Apply	10	5	10
Analyze	2.5		
Evaluate	2.5		
Create			

SEE (50 Marks – Theory/Lab)

Bloom's Category	Tests (theory)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	

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COMMUNICATIVE ENGLISH

Course Code	21DAEC40A
L: T: P:S	0:0:0:0
Exams Hours	

Credits	00
CIE Marks	50
SEE Marks	50

Course Outcomes: At the end of the Course, the student will be able to:

21DAEC40A.1	Recognise the grammatical structures in English and identify errors in sentences
21DAEC40A.2	Demonstrate conversational skills using situational vocabulary
21DAEC40A.3	Examine the importance of sub skills of listening for effective communication
21DAEC40A.4	Analyse the importance of receptive and productive skills of communication

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
21DAEC40A.1										3		3		
21DAEC40A.2									3	3		3		
21DAEC40A.3										3		3		
21DAEC40A.4										3		3		

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

TEXT BOOKS:
1) Grammar Practice Activities- Penny Ur, Cambridge University Press
2) Intermediate English Grammar   Raymond Murphy Cambridge University Press

REFERENCE BOOKS:
1) Grammar & Composition. New Delhi: S. Chand. ISBN 81-219- 2197-X.
2) Wren, P.C.; Martin, H., A Final Course of Grammar & Composition, S Chand.

New Horizon College of Engineering

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Syllabus

Module No	Module Contents	Hrs	COs
1	**Self-introduction** – Talking about self, ambition, hobbies, likes, dislikes, talents and achievements. Asking for and Giving Information (Pair work) **(SEE Task 1)** Asking question. (WH, Aux Verbs), Helping Verbs usage chart, question tags. Nouns, Pronouns	5	**21DAEC40A.1**
2	Talking about Routine, Repeated activities (Frequency adverbs) Verb: Main / Assistant, Forms of Verbs, Use of Do, Does in negative and question forms Verbal Ability Error Detection: Subject Verb Agreement	5	**21DAEC40A.1** **21DAEC40A.2**
3	Describing people, things, actions, process **(SEE Task 2)** Describing on going actions Situational conversations, role plays Adjectives, Adverbs **Verbal Ability**: Sentence correction, Sentence completion.	5	**21DAEC40A.1** **21DAEC40A.2** **21DAEC40A.4**
4	**Listening Skills:** Importance of listening for effective communication Traits of a good listener Listening sub skills Listening to audio files of short stories, news, TV clips, Documentaries Gap filling exercise and Paraphrasing **Verbal Ability:** Common Errors in English 1 (articles, prepositions) Cloze Exercises	4	**21DAEC40A.2** **21DAEC40A.4**
5	**Presentation Skills:** **Nonverbal Communication (Body Language):** Kinesics, Oculesics, Paralanguage. Overcoming stage fear, Organising a speech - Preparation, Practise, Delivery **Articulation of Ideas:** How to generate ideas and express them. Fluency development activities like comparing, expressing opinions, agreeing & disagreeing **(SEE Task 3)** Group Discussion	5	**21DAEC40A.1**

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Assessment Pattern

CIE (50 Marks – Theory)

Bloom's Category	Tests
Marks	**50**
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	
Create	

SEE (50 Marks – Theory)

| Bloom's Category	Tests (theory)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	

APPENDIX-A
Outcome Based Education

Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes. There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes

Course Outcome

↓

Program Outcome

↓

Program Educational Objectives

↓

Department Mission

↓

Department Vision
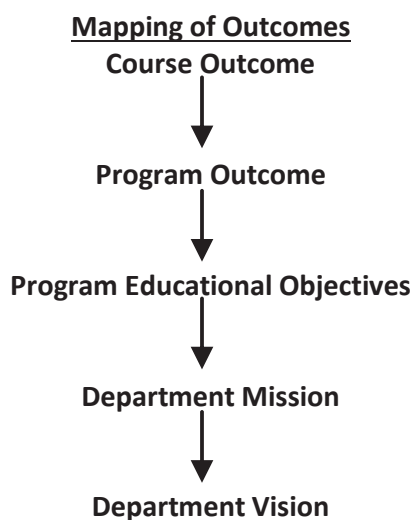
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APPENDIX-B

The Graduate Attributes of NBA

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

Conduct investigations of complex problems: The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
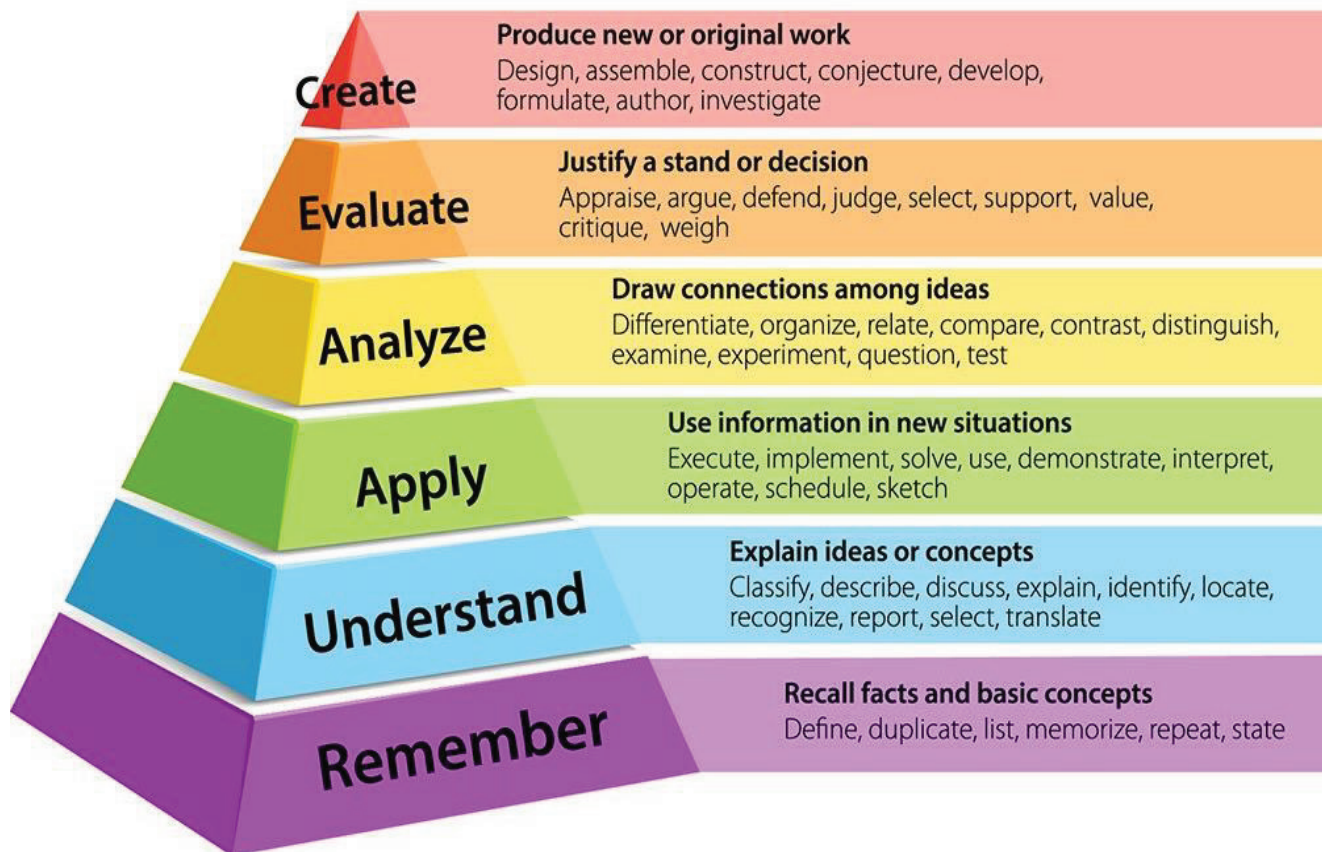
Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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APPENDIX-C
BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies. **[eduglosarry.org]**

Create
Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate

Evaluate
Justify a stand or decision
Appraise, argue, defend, judge, select, support, value, critique, weigh

Analyze
Draw connections among ideas
Differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

Apply
Use information in new situations
Execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

Understand
Explain ideas or concepts
Classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

Remember
Recall facts and basic concepts
Define, duplicate, list, memorize, repeat, state

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