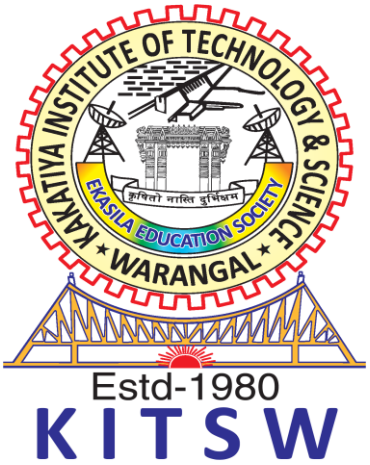
B.TECH. CURRICULUM

ACADEMIC YEAR: 2026–27

DEPARTMENT OF MECHANICAL ENGINEERING (ME)

Undergraduate Rules and Regulations-2026 (URR26)
In accordance with the National Education Policy 2020
w.e.f AY 2026-27

Regulations Governing the
Choice Based Credit System and
Multiple Entry and Multiple Exit Options
with
Competancy-Focused Outcome Based Curriculum (CF-OBC)



DEPARTMENT OF MECHANICAL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 506 015 TELANGANA
(UGC Autonomous Institute Under Kakatiya University, Warangal)

Abbreviations

L	Lecture Hour	E	Total Engagement in Hours
T	Tutorial Hour	C	Credit Assigned
P	Practical Hour		

I SEMESTER (Stream – II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
-	IKSC	U26IK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)					-
1	BSC	U26MH101	Differential Calculus and Ordinary Differential Equations	2	1	-	3	3
2	BSC	U26CY102B	Engineering Chemistry	2	1	-	3	3
3	ESC	U26ME103	Programming for Problem Solving with C	2	1	-	3	3
4	HSMC	U26MH104	English Communication and Report Writing	2	1	-	3	3
5	PCC	U26ME105	Engineering Mechanics	2	1	-	3	3
6	BSC	U26CY106B	Engineering Chemistry Laboratory	-	-	2	2	1
7	ESC	U26ME107	Programming for Problem Solving with C Laboratory	-	-	2	2	1
8	VAC	U26VA108	Sports & Yoga	-	-	2	2	1
9	ESC	U26ME109	Engg. Graphics & CAD*	1	-	4	5	3
			Total:	11	5	10	26	21
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

S. No.	Course Code	Course Title		S. No.	Course Code	Course Title
Pool –V				**Pool – VI**		
1.	U26CY102A	Engineering Chemistry (for CE)		1.	U26CY106A	Engineering Chemistry Laboratory (for CE)
2.	U26CY102B	Engineering Chemistry (for ME)		2.	U26CY106B	Engineering Chemistry Laboratory (for ME)
3.	U26CY102C	Engineering Chemistry (for EEE/ECE/ECI)		3.	U26CY106C	Engineering Chemistry Laboratory (for EEE/ECE/ECI)
4.	U26CY102D	Engineering Chemistry (for CS/IT)		4.	U26CY106D	Engineering Chemistry Laboratory (for CS/IT)

II SEMESTER (Stream – II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	BSC	U26MH201	Matrix Theory and Vector Calculus	2	1	-	3	3
2	BSC	U26PY202B	Engineering Physics	2	1	-	3	3
3	ESC	U26ME203	Data Structures through C	2	1	-	3	3
4	ESC	U26EE204A	Basic Electrical & Electronics Engineering	2	1	-	3	3
5	PCC	U26ME205	Thermodynamics	2	1	-	3	3
6	BSC	U26PY206B	Engineering Physics Laboratory	-	-	2	2	1
7	ESC	U26ME207	Data Structures Through C Laboratory	-	-	2	2	1
8	ESC	U26EE208A	Basic Electrical & Electronics Engineering Laboratory	-	-	2	2	1
9	AEC	U26AE210	IDEA Lab Makerspace	-	-	2	2	1
			Total:	10	5	8	25	19
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)								

S. No.	Course Code	Course Title		S. No.	Course Code	Course Title
Pool – IX				**Pool – XI**		
1.	U26PY202A	Engineering Physics (for CE)		1.	U26PY206A	Engineering Physics Laboratory (for CE)
2.	U26PY202B	Engineering Physics (for ME)		2.	U26PY206B	Engineering Physics Laboratory (for ME)
3.	U26PY202C	Engineering Physics (for EEE/ECE/ECI)		3.	U26PY206C	Engineering Physics Laboratory (for EEE/ECE/ECI)
4.	U26PY202D	Engineering Physics (for CS/IT)		4.	U26PY206D	Engineering Physics Laboratory (for CS/IT)

Pool – X				Pool – XII		
1.	UU26EE204A	Basic Electrical & Electronics Engineering (for CE/ME)		1.	UU26EE208A	Basic Electrical & Electronics Engineering Laboratory (for CE/ME)
2.	UU26EE204B	Basic Electrical Engineering (for ECE/ECI)		2.	UU26EE208B	Basic Electrical Engineering Laboratory (for ECE/ECI)
3.	UU26EE204C	Basic Electrical Engineering (for EEE)		3.	UU26EE208C	Basic Electrical Engineering Laboratory (for EEE)
4.	UU26EE204D	Basic Electrical Engineering (for CS/IT)		4.	UU26EE208D	Basic Electrical Engineering Laboratory (for CS/IT)

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute
OR
Successful completion of two suitable skill based courses (external) to qualify for Certification

A. After First Year: (UG Certificate in ME)

(i) The candidate should pass any two of the following additional courses (ITI Level) during the 2-Months internship at institute

Exit Option to Qualify UG Certificate in ME: Any Two (02) Courses during the 2 - Months internship								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	PCC	U26ME212X	Internal Combustion Engines	**2**	**-**	**2**	**4**	**3**
2	PCC	U26ME213X	Machine Drawing & Modelling	**2**	**-**	**2**	**4**	**3**
3	PCC	U26ME214X	Basic Mechanical Engineering	**2**	**-**	**2**	**4**	**3**
4	PCC	U26ME215X	Any other course approved by BoS Chair and Dean AA	**2**	**-**	**2**	**4**	**3**

(OR)

(ii) Any two suitable skill based courses to qualify for Certification.

Exit Option to Qualify UG Certificate in ME: Any Two (02) Skill based Courses -:								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	SEC	U26SE212X	Certificate course in Product Design and Development (Offered by MSME CITD)	**-**	**-**	**6**	**6**	**3**
2	SEC	U26SE213X	Foundry men (NSQF)	**-**	**-**	**6**	**6**	**3**
3	SEC	U26SE214X	Mechanic Diesel (NSQF)	**-**	**-**	**6**	**6**	**3**
4	SEC	U26SE215X	Certificate Course in Product Design and Manufacturing (CITD)	**-**	**-**	**6**	**6**	**3**
5	SEC	U26SE216X	Any other skill based course approved by BoS Chair and Dean AA	**-**	**-**	**6**	**6**	**3**

III SEMESTER (STREAM -II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	BSC	U26MH301B	Applied Mathematics	2	1	-	3	3
2	PCC	U26ME302	Material Science & Metallurgy	2	1	-	3	3
3	PCC	U26ME303	Mechanics of Materials	2	1	-	3	3
4	ESC	U26ME304	Python Programming	2	1	-	3	3
5	PCC	U26ME305	Fluid Mechanics and Hydraulic Machines	2	1	-	3	3
6	PCC	U26ME306	Manufacturing Processes	2	1	-	3	3
7	ESC	U26ME307	Python Programming Labroratory	-	-	2	2	1
8	PCC	U26ME308	Mechanics of Materials Laboratory	-	-	2	2	1
9	PCC	U26ME309	Production Engineering Laboratory-I	-	-	2	2	1
Total:				**12**	**6**	**6**	**24**	**21**
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**"Programming in C" bridge course for Non-CS/IT Lateral Entry students**				

Branch Specific Mathematics (Pool - XIII)		
S. No.	**Course Code**	**Course Title**
1.	U26MH401A	Numerical and Statistical Methods ***(for CE)***
2.	U26MH401B	Applied Mathematics ***(for ME)***
3.	U26MH401D	Discrete Mathematics and Probability Statistics ***(for CSN, CSO & IT)***
4.	U26MH401E	Essential Mathematics and Statistics for Machine learning ***(for CSM)***
5.	U26MH401F	Essential Mathematics and Statistics for Data science ***(for CSD)***

IV SEMESTER (STREAM -II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	PCC	U26ME401	IC Engines and Gas Turbines	2	1	-	3	3
2	PCC	U26ME402	Machine Drawing	2	-	2	4	3
3	PCC	U26ME403	Design of Machine Elements	2	1	-	3	3
4	PCC	U26ME404	Machine Tools & Metrology	2	1	-	3	3
5	PCC	U26ME405	Artificial Intelligence & Machine Learning	2	1	-	3	3
6	VAC	U26CY406	Environmental Studies	2	-	-	2	1
7	PCC	U26ME407	Thermal Engineering Laboratory	-	-	2	2	1
8	PCC	U26ME408	Machine Tools & Metrology Laboratory	-	-	2	2	1
9	PCC	U26ME409	AIML Applications Laboratory	-	-	2	2	1
10	VAC	U26VA410	Soft & Interpersonal Skills	-	-	2	2	1
			Total	12	4	10	26	20
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute

OR

Successful completion of two suitable skill based courses (external) to qualify for Certification

B. After Second Year: (UG Diploma in ME)

(i) The candidate should pass any two of the following additional courses (Diploma Level) during the 2-Months internship at institute

Exit Option to Qualify UG Diploma in ME: Any Two (02) Courses during the 2 - Months internship								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	PCC	U26ME412X	Theory of Machines	**2**	**-**	**2**	**4**	**3**
2	PCC	U26ME413X	Workshop Technology	**2**	**-**	**2**	**4**	**3**
3	PCC	U26ME414X	Refrigeration Systems	**2**	**-**	**2**	**4**	**3**
4	PCC	U26ME415X	Any other course approved by BoS Chair and Dean AA	**2**	**-**	**2**	**4**	**3**

(OR)

(ii) Any two suitable skill based courses to qualify for Diploma.

Exit Option to Qualify UG Diploma in ME: Any Two (02) Skill based Courses -:								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	SEC	U26SE412X	Certificate Course in Product Design and Analysis (Offered by MSME-CITD)	**-**	**-**	**6**	**6**	**3**
2	SEC	U26SE413X	Certificate Course in Design Of Plastic Injection Moulds (CITD)	**-**	**-**	**6**	**6**	**3**
3	SEC	U26SE414X	Certificate Course in Design of Press Tools (CITD)	**-**	**-**	**6**	**6**	**3**
4	SEC	U26SE415X	Mechanic Motor Vehicle (NSQF)	**-**	**-**	**6**	**6**	**3**
5	SEC	U26SE416X	Any other skill based course approved by BoS Chair and Dean AA	**-**	**-**	**6**	**6**	**3**

B. Tech Honours with Research:

- **Students opting for B. Tech Honours with Research, shall undergo a 2-Month Mandatory Research Internship-I (5 Credits) at respective department during the summer vacation after IV Semester.**

V SEMESTER (STREAM -II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	OE	U26OE501X	Open Elective-Sustainable Development Goals Basket (OE-SDG)	2	1	-	3	3
2	PCC	U26ME502	Applied Thermodynamics	2	1	-	3	3
3	PCC	U26ME503	Kinematics of Machinery	2	1	-	3	3
4	PCC	U26ME504	Machining Science	2	1	-	3	3
5	PCC	U26ME505	Heat Transfer	2	1	-	3	3
6	IKSC	U26IK506B	Essence of Indian Traditional Knowledge	2	-	-	2	2
7	PCC	U26ME507	Heat Transfer Laboratory	-	-	2	2	1
8	PCC	U26ME508	Machining Science Laboratory	-	-	2	2	1
9	PCC	U26ME509	Modelling Laboratory	-	-	2	2	1
10	ELC	U26ME510	Seminar	-	-	2	2	1
			Total:	12	5	8	25	21
Additional Learning@: Maximum credits allowed for Honours/Minor				-	-		-	5
Total credits for Honours/Minor students:				-		-	-	26
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

Sustainable Development Goals Basket		
Sr. No.	**Course Code**	**Course Title**
1.	U26OE501A	Sustainable Waste Management and Circular Economy (Offered by CE Department)
2.	U26OE501B	Sensors and Actuators for Sustainable Smart cities and Health care (Offered by ECI Department)
3.	U26OE501C	Carbon Reduction and Net Zero (Offered by EEE Department)
4.	U26OE501D	Object Oriented Programming through Java (Offered by IT Department)
5.	U26OE501E	Intelligent Imaging for Sustainable Engineering (Offered by ECE Department)

VI SEMESTER (STREAM-II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	OE	U26OE601X	Startups & Entrepreneurship Basket	2	1	-	3	3
2	PCC	U26ME602	Production and Operations Management	2	1	-	3	3
3	PCC	U26ME603	Dynamics of Machinery	2	1	-	3	3
4	PCC	U26ME604	Refrigeration & Air Conditioning	2	1	-	3	3
5	PCC	U26ME605	Finite Element Methods	2	1	-	3	3
6	IKSC	U26IK606A	Universal Human Values - II	2	-	-	2	2
7	HSMC	U26MH607	English Language Laboratory	-	-	2	2	1
8	PCC	U26ME608	Finite Element Methods Laboratory	-	-	2	2	1
9	PCC	U26ME609	RAC & DM Lab	-	-	2	2	1
10	ELC	U26ME610	Mini Project	-	-	2	2	1
			Total:	12	5	8	25	21
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	5
Total credits for Honours/Minor students:				**-**	**-**	**-**	**-**	**26**
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

Startups & Entrepreneurship Basket		
Sr. No.	**Course Code**	**Course Title**
1.	U26OE601A	Design Thinking
2.	U26OE601B	Innovative Product Design and Development
3.	U26OE601C	Entrepreneurship
4.	U26OE601D	Design Studio
5.	U26OE601E	Any other course approved by BoS Chair and Dean AA

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute

OR

Successful completion of two suitable skill based courses (external) to qualify for Certification

C. After Third Year:(B. Voc. in ME)

(i) The candidate should pass any two of the following additional courses (Degree Level) during the 2-Months internship at institute

Exit Option to Qualify B. Voc in ME: Any Two (02) Courses during the 2 - Months internship								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	PCC	U26ME610X	Industrial Robotics	**2**	**-**	**2**	**4**	**3**
2	PCC	U26ME611X	Computer Integrated Manufacturing	**2**	**-**	**2**	**4**	**3**
3	PCC	U26ME612X	Power Plant Engineering	**2**	**-**	**2**	**4**	**3**
4	PCC	U26ME613X	Any other course approved by BoS Chair and Dean AA	**2**	**-**	**2**	**4**	**3**

(OR)

(ii) Any two suitable skill based courses to qualify for. Voc in ME Degree.

Exit Option to Qualify B. Voc in ME: Any Two (02) Skill based Courses -:								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	SEC	U26SE614X	Certificate Course in Design and Analysis of Mechanical Systems using NX and SIMCENTER (Offered by: Centre of excellence by Digital Manufacturing and Automation, NIT, Warangal)	**-**	**-**	**6**	**6**	**3**
2	SEC	U26SE615X	Certificate Course in CNC Programming & Machining (CITD)	**-**	**-**	**6**	**6**	**3**
3	SEC	U26SE616X	Refrigeration and Air Conditioning Technician (NSQF)	**-**	**-**	**6**	**6**	**3**
4	SEC	U26SE617X	Certificate Course in Product Design and Development (CITD)	**-**	**-**	**6**	**6**	**3**
5	SEC	U26SE618X	Any other skill based course approved by BoS Chair and Dean AA	**-**	**-**	**6**	**6**	**3**

(Note to HoDs on PCC: Under PCC the departments shall plan appropriate courses upto 6th semester covering GATE syllabus).

VII SEMESTER (STREAM -II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	OE	U26OE701Y	Open Elective – Management Basket (OE-MB)	2	1	-	3	3
2	PEC	U26ME702	Program Elective - I/ MOOCs-I	2	1	-	3	3
3	PCC	U26ME703	Computational Fluid Dynamics	2	1		3	3
4	PCC	U26ME704	Additive Manufacturing	2	1	-	3	3
5	PCC	U26ME705	Design of Transmission Systems	2	1	-	3	3
6	PCC	U26ME706	Computational Fluid Dynamics Laboratory	-	-	2	2	1
7	PCC	U26ME707	Production Engineering Laboratory-II	-	-	2	2	1
8	ELC	U26ME708	Internship Evaluation	-	-	2	2	1
9	ELC	U26ME709	Major Project Phase-1 / Industrial Internship -1	-	-	8	8	4
Total:				10	5	14	29	22
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	26

Management Courses Basket		
Sr. No.	**Course Code**	**Course Title**
1.	U26OE701A	Management Economics and Accountancy
2.	U26OE701B	Finance for Engineers
3.	U26OE701C	Organizational Behaviour
4.	U26OE701D	E-Commerce and Digital Marketing
5.	U26OE701E	Any other course approved by BoS Chair and Dean AA

@ List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

B. Tech Honours with Research

(i). Students opting for B. Tech Honours with Research, shall complete Research Methodology Course (4 Credits) through MOOCS (OR) a workshop / FDP of not less than one week on "Research Methodologies" (4 Credits).

(ii). Internship Evaluation for the students opting B. Tech Honours with Research,will be done on the 2-Month Research internship-II.

VIII SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	PEC	U26ME801	Program Elective - II / MOOCs-II	2	1	-	3	3
2	PEC	U26ME802	Program Elective - III / MOOCs-III	2	1	-	3	3
3	PEC	U26ME803	Program Elective - IV / MOOCs-IV	2	1	-	3	3
4	ELC	U26ME804	Major Project, Phase – 2 / Industrial Internship - 2	-	-	12	12	6
Total:				6	3	12	21	15
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	19

@ List of courses for additional learning through MOOCs towards Honours/Minor in Engineering shall be prescribed by the department under Honours/ Minor Curricula

B. Tech Honours with Research

Students opting for B. Tech Honours with Research, shall Publish a research paper in reputed journal indexed by SCI / SCOPUS/Web of Science (4 Credits).

SUMMARY

SEMESTER	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS FOR STREAM-II	21	19	21	20	21	21	22	15	160

PROGRAM ELECTIVE COURSES (PEC)

There are four slots allotted to Program Elective Courses (PECs).

VERTICAL / PROFESSIONAL ELECTIVE	PROFESSIONAL ELECTIVE1 (PE1)	PROFESSIONAL ELECTIVE1 (PE2)	PROFESSIONAL ELECTIVE1 (PE3)	PROFESSIONAL ELECTIVE1 (PE4)
VERTICAL 1: Thermal Engineering	**U26ME702A:** Energy Audit and Management	**U26ME801A:** Power Plant Engineering	**U26ME802A:** Electric and Hybrid Vehicles	**U26ME803A:** Sustanable Energy Technology
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 2: Design Engineering	**U26ME702B:** Product Design	**U26ME801B:** Automobile Engineering	**U26ME802B:** Robotics	**U26ME803B:** Composite Materials
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 3: Production Engineering	**U26ME702C:** Computer Integrated Manufacturing	**U26ME801C:** Modern Machining Processes	**U26ME802C:** Digital Manufacturing	**U26ME803C:** Total Quality Management
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 4:	**U26ME702D:** Industry 4.0	**U26ME801D:** Design of Thermal Equipment	**U26ME802D:** Geometrical Dimensioning and Tolerancing	**U26ME803D:** Industrial Management
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			

S. No.	CATEGORY	COURSE COMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (%OF CREDITS)
1	BSC	Basic Science Courses	07	17	10.625
2	ESC	Engineering Science Courses	09	19	11.875
3	PCC	Program Core Courses	34	78	48.75
4	PEC	Program Elective Courses	04	12	7.5
5	OEC	Open Elective Courses	03	09	5.625
6	HSMC	Humanity, Social Sciences and Management Courses	02	04	2.5
7	ELC	Experiential Learning Courses	05	13	8.125
8	VAC	Value Added Courses	03	03	1.875
9	AEC	Ability Enhancement Courses	01	01	0.625
10	IKSC	Indian Knowledge System Courses	02	04	2.5
		Total	**70**	**160**	**100**

The curriculum supports approximately 60% of Theory and 40 % of Lab including PW. Online courses are optional.

Semester	Number of Courses / Number of Credits (*Course Category wise*)										
	BSC	**ESC**	**PCC**	**PEC**	**OEC**	**HSMC**	**ELC**	**VAC**	**AEC**	**IKSC**	**TOTAL**
I	3/7	3/7	1/3	-	-	1/3	-	1/1	-	-	9/21
II	3/7	4/8	1/3	-	-	-	-	-	1/1	-	9/19
III	1/3	2/4	6/14	-	-	-	-	-	-	-	9/21
IV	-	-	8/18	-	-	-	-	2/2	-	-	10/20
V	-	-	7/15	-	1/3	-	1/1	-	-	1/2	10/21
VI	-	-	6/14	-	1/3	1/1	1/1	-	-	1/2	10/21
VII	-	-	5/11	1/3	1/3	-	2/5	-	-	-	9/22
VIII	-	-	-	3/9	-	-	1/6	-	-	-	4/15
Total	**7/17**	**9/19**	**34/78**	**4/12**	**3/9**	**2/4**	**5/13**	**3/3**	**1/1**	**2/4**	**70/160**
% Weightage of Course Category	**10.625%** (17/160)	**11.875%** (19/160)	**48.75%** (78/160)	**7.5%** (12/160)	**5.625%** (9/160)	**2.5%** (4/160)	**8.125%** (13/160)	**1.875%** (3/160)	**0.625%** (1/160)	**2.5%** (4/160)	**100 %** (160/160)

* Seminar- 1 C , Mini Project- 1 C, Intership Evalution-1 C, Major Project : 4+6

I SEMESTER (Stream – II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
-	IKSC	U26IK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)					-
1	BSC	U26MH101	Differential Calculus and Ordinary Differential Equations	2	1	-	3	3
2	BSC	U26CY102B	Engineering Chemistry	2	1	-	3	3
3	ESC	U26ME103	Programming for Problem Solving with C	2	1	-	3	3
4	HSMC	U26MH104	English Communication and Report Writing	2	1	-	3	3
5	PCC	U26ME105	Engineering Mechanics	2	1	-	3	3
6	BSC	U26CY106B	Engineering Chemistry Laboratory	-	-	2	2	1
7	ESC	U26ME107	Programming for Problem Solving with C Laboratory	-	-	2	2	1
8	VAC	U26VA108	Sports & Yoga	-	-	2	2	1
9	ESC	U26ME109	Engg. Graphics & CAD*	1	-	4	5	3
			Total:	11	5	10	26	21
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

S. No.	Course Code	Course Title		S. No.	Course Code	Course Title
Pool –V				**Pool – VI**		
1.	U26CY102A	Engineering Chemistry (for CE)		1.	U26CY106A	Engineering Chemistry Laboratory (for CE)
2.	U26CY102B	Engineering Chemistry (for ME)		2.	U26CY106B	Engineering Chemistry Laboratory (for ME)
3.	U26CY102C	Engineering Chemistry (for EEE/ECE/ECI)		3.	U26CY106C	Engineering Chemistry Laboratory (for EEE/ECE/ECI)
4.	U26CY102D	Engineering Chemistry (for CS/IT)		4.	U26CY106D	Engineering Chemistry Laboratory (for CS/IT)

DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS			
Class: B. Tech. I – Semester		**Branch:** Common to all branches	
Course Code:	**U26MH101**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : examine the convergence of a series and interpret mean value theorems.

CO2 : apply partial differentiation to functions of several variables in solving various engineering problems.

CO3 : apply appropriate methods of differential equations of first order and first degree to solve real life engineering problems.

CO4 : analyze the solutions of higher order linear differential equations with constant coefficients

UNIT-I	**9 Hrs**

Infinite Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests-Limit form, Integral test, D'Alembert's Ratio test, Cauchy's root test

Differential Calculus and its applications: Fundamental theorems-Rolle's theorem (Geometrical interpretation), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem, Taylor's theorem (Generalized mean value theorem), Expansions of functions- Maclaurin's series, Taylor's series, Maxima and Minima-Conditions, Practical problems (rectangle, right circular cylinder, cone)

UNIT-II	**9 Hrs**

Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, Functional relationship, Geometrical Interpretation-Tangent plane and Normal to a surface, Taylor's theorem for function of two variables (without proof), Errors and approximations, Total differential, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral sign

UNIT-III	**9 Hrs**

Differential equations of first order (DE): Reorientation of differential equation of first order and first degree (Formation a differential equation, variables separable method, homogeneous equations, Linear equations), Exact differential equations, Equations reducible to exact equations

Applications of differential equations of first order: Orthogonal trajectories - Orthogonal trajectories of the family of curves f(x, y, c)=0, Physical applications-Motion of a boat across a stream, Resisted motion, Velocity of escape from the earth, Simple electric circuits - RL series circuit, Newton's law of cooling, Rate of decay of Radio-active materials, Rate of growth of population

UNIT-IV	**9 Hrs**

Linear differential equations: Linear differential equations with constant coefficients, Rules for finding complementary function, Inverse operator, Rules for finding the particular integral ($Q=e^{ax}$, $\sin(ax+b)$ or $\cos(ax+b)$, x^m and $e^{ax}V(x)$), Method of variation of parameters, Linear dependence of solutions

Applications of linear differential equations: Simple harmonic motion, Simple pendulum, Oscillations of spring, Oscillatory electrical circuit-LCR circuit, Electro-mechanical analog

Textbook(s):

1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017

Reference Book(S):

1. Shanti Narayan, Dr. Mittal P.K, *Differential Calculus*, S. Chand & Co., New Delhi, 1st edition, Reprint 2014
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John wiely & sons, 10th edition, 2020
3. S.S. Sastry, *Engineering Mathematics, Vol.II,* Prentice Hall of India, 3rd edition, 2014.

Web and Video link(s):

1. https://youtu.be/4EYko9rdF7g?si=WUu12 *NPTEL Video Lecture on Infinite series by Prof. S.K.Ray, Professor of Mathematics, IITK Kanpur.*
2. https://youtu.be/0apMXhWG_W8?si=M-abw2Gq3buX5HLM *NPTEL Video Lecture on Fundamental mean value theorems by Prof. Jithedra Kumar, Professor of Mathematics, IITK Kharagpur.*
3. https://youtu.be/6r5jfT8xrXM?si=ryLXYVJr4-iUkdlV; *NPTEL Video Lecture on Exact Differential Equations, Prof. Jithedra Kumar, Professor of Mathematics, IIT Kharagpur.*
4. https://youtu.be/kbGhrqV9AOM?si=yGyK_V7kJKGa3OaR *NPTEL Video Lecture on Orthogonal Trajectories of family of curves by Prof. Aditya Sharma, Professor of Physics, IISE Bhopal.*
5. *https://youtu.be/btOCUmJkrrg?si=zq3nB00kplm7b5se; NPTEL Video Lecture on Higher Order Linear Differential Equations, Prof. Jithedra Kumar, Professor of Mathematics, IIT Kharagpur..*

Course Articulation Matrix (CAM):		**U26MH101:DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U26MH101.1**	2	2	1	1	-	-	-	1	1	-	1	1	1
CO2	**U26MH101.2**	2	2	1	1	-	-	-	1	1	-	1	1	1
CO3	**U26MH101.3**	2	2	1	1	-	-	-	1	1	-	1	1	1
CO4	**U26MH101.4**	2	2	1	1	-	-	-	1	1	-	1	1	1
U26MH101		**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	Examine the convergence of a series and interpret mean value theorems.	SDG4	Quality Education	Develops analytical thinking, mathematical reasoning, and problem-solving skills essential for quality technical education.
CO2	Apply partial differentiation to functions of several variables in solving various engineering problems.	SDG9	Industry, Innovation and Infrastructure	Supports engineering design, optimization, modelling, and innovation in industrial and technological applications.
CO3	Apply appropriate methods of differential equations of first order and first degree to solve real-life engineering problems.	SDG9	Industry, Innovation and Infrastructure	Differential equation models are widely used in transportation, environmental systems, population studies, and engineering infrastructure.
CO4	Analyze the solutions of higher order linear differential equations with constant coefficients.	SDG9	Industry, Innovation and Infrastructure	Helps in analyzing dynamic systems, control systems, electrical/mechanical engineering applications, and technological advancement.

ENGINEERING CHEMISTRY

Class: B. Tech. I – Semester		**Branches:** ME	
Course Code:	**U26CY102B**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: apply the concepts of electro chemical energy systems in engineering practice

CO2: adapt the essential techniques of water analysis, treatment and corrosion & it's control.

CO3: appraise applications of ferrous, non-ferrous, super alloys and polymers

CO4: apply the knowledge of lubricants, combustion in the field of engineering

UNIT-I	**9 Hrs**

Electrochemical Energy Systems: Specific conductance, Equivalent conductance, Effect of dilution, Conductometric titrations- Acid base titrations- Strong acid vs strong base, Strong acid vs weak base, Weak acid vs strong base, Weak acid vs weak base, Advantages of conductometric titrations, Galvanic cell, Electrode potential, Electro motive force, Nernst equation, Potentiometric titrations- Acid base titrations, advantages, Biosensors

Batteries: Classification of batteries, Construction, Working principle, Advantages, Disadvantages and applications of Lead-acid battery and Li-ion battery

UNIT-II	**9 Hrs**

Water Analysis and Treatment: Hardness of water, Determination of hardness of water by using EDTA, Determination of alkalinity, Determination of fluoride by spectro photometry, Determination of dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Softening of water-ion exchange process, Desalination of brackish water, Reverse osmosis, Electro dialysis

Corrosion: Introduction, Corrosion by pure chemical reaction (Dry corrosion), Electro chemical corrosion (Wet corrosion), Factors influencing corrosion, Prevention methods of corrosion-Cathodic protection, Electroplating

UNIT-III	**9 Hrs**

Ferrous Metals and Alloys: Types of steels, Types of cast irons, Effect of common alloying elements on plain carbon steels

Non-Ferrous Metals and Alloys: Composition, Properties, Applications of aluminium and its alloys, Copper and its alloys, Titanium and its alloys

Super Alloys: Importance, Classification, Titanium based, Nickel based, Cobalt based [Inconel 718, Ti-6 Al-4v], Chemical composition, Properties and applications

Polymers: Introduction, Classification of polymers-Natural and synthetic polymers; Thermoplastic and thermosetting polymers, Functionality, Molecular weight of polymers, Plastics, Rubbers (Elastomers), Liquid Silicone Rubber (LSR), Fibers, Properties of polymers, Degradation of polymer, Polymer composites

UNIT-IV	**9 Hrs**

Fuels: Properties of solid, liquid and gaseous fuels; Flash and fire points, Viscosity measurement– Redwood and Saybolt viscometer, Measurement of calorific value, Exploration of crude petroleum, Evaluation of crude, Distillation, Characteristics of fuels for internal combustion engines-Knocking, Octane number, Cetane number, Compressed natural gas (CNG), Liquefied Natural Gas (LPG), Power alcohol and Biodiesel

Combustion: Stoichiometric air-fuel ratio, Air-fuel ratio from analysis of products of combustion, Conversion of volumetric analysis to mass analysis and vice versa, Mass of dry flue gases per kg of fuel burnt, Mass of excess air supplied

Wear and Lubrication: Types of wear, Lubricants, Types, Properties and functions

Chemistry of Carbon and Hydrogen: Hydrogen-industrial method of preparation, Properties, Storage, Applications, Carbon - isotopes, Allotrope, Chemical properties and uses.

Textbook(s):

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 17th Edn., 2019 (chapters 1, 2, 3, 5, 6, 7, 10, 29, 30)
2. William D. Callister Jr & David G. Rethwisch, *Material Science Engineering*, 10th Edn., Wiley, 2018 (chapter 11)

Reference Book(s):

1. S. Agarwal, *Engineering Chemistry Fundamentals and Applications*. Cambridge University Press, May 23, 2019
2. Rajesh K., Prasad, Ojha T. P., *Non-Conventional Energy Sources*, 4th Edn., Jain Brothers, (Chapter 6), 2014

Web and Video link(s):

1. *https://elearn.nptel.ac.in/shop/iit-workshops/completed/battery-cell-technology-materials-and **industrial-applications/?v=c86ee0d9d7ed** NPTEL Video Lecture on Battery technology by*
2. *Dr. Kothandaraman, Professor of Chemistry, IIT Madras & Dr. Raghunathan, Professor of Chemical engineering, IIT Madras*

Course Articulation Matrix (CAM):		**U26CY102B: ENGINEERING CHEMISTRY (*for ME*)**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26CY102B.1**	2	-	-		1	1	1	-	1	-	1	1	1
CO2	**U26CY102B.2**	2	-	-	-	1	1	1		1	-	1	1	1
CO3	**U26CY102B.3**	2	1	-	-	-	1	1	-	1	-	1	1	1
CO4	**U26CY102B.4**	2	1	-	-	1	1	1	-	1	-	1	1	1
U26CY102B		2	1	-	-	1	1	1	-	1	-	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply the concepts of electrochemical energy systems in engineering practice	SDG7	Affordable and Clean Energy	Electro chemical energy systems such as batteries and fuel cells provide clean, reliable, and efficient energy storage and reduce dependence on fossil fuels, promote renewable energy utilization.
CO2	adapt the essential techniques of water analysis, treatment and corrosion & it's control	SDG3	Good Health and well being	Water analysis techniques help identify contaminants and ensure safe drinking water, thereby protecting human health and preventing water-borne diseases. Corrosion treatment of solid materials improves the safety and durability of pipelines, storage systems, and medical equipment.
CO3	appraise applications of ferrous, non-ferrous, super alloys and polymers	SDG9	Industry, Innovation and Infrastructure	The study of ferrous, non-ferrous, super alloys and polymers helps in selecting suitable materials for advanced engineering, industrial applications and promote innovation, durable infrastructure, and efficient manufacturing technologies.
CO4	apply the knowledge of lubricants, combustion in the field of engineering	SDG13	Climatic action	Knowledge of lubricants , combustion helps improve fuel efficiency and reduce energy losses in engineering systems. Proper combustion techniques and suitable lubricants minimize harmful emissions and support cleaner industrial operations.

PROGRAMMING FOR PROBLEM SOLVING WITH C

Class: B. Tech. I – Semester		**Branch:**ME	
Course Code:	**U26ME103**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : enumerate programming development steps, design an algorithm and draw flow chart for a given application

CO2 : apply logical skills for problem solving using control structures and arrays

CO3 : develop string operations and modular programming with functions

CO4 : analyse and implement structures, unions, pointers and files in C programming

UNIT-I	**9 Hrs**

Introduction to Programming: Components of a computer, concept of hardware and software, Art of programming through algorithms and flowcharts

Overview of C: History of C, Importance of C, Basic structure of C programs

Constants, Variables and Data Types: Character set, C tokens, Declaration of variables, Defining symbolic constants

Managing Input and Output Operations: Reading a character, Writing a character**,** Formatted input, Formatted output

Operators and Expressions: Arithmetic, Relational, Increment, Decrement, Conditional, Logical, Bit-wise, Special operators, Arithmetic expressions, Evaluation of expressions, Operator precedence and associativity

UNIT-II	**9 Hrs**

Decision Making and Branching: Simple if statement, if-else statement, Nesting of if-else statements, else if ladder, switch statement, Conditional operator, goto statement

Decision Making and Looping: while statement, do-while statement, for statement, Nested loops, Jumps in loops

Arrays: One-dimensional arrays, Declaration of one-dimensional arrays, Initialization of one-dimensional arrays, Linear search, Two-dimensional arrays, Initializing two dimensional arrays, Multi-dimensional arrays, Dynamic arrays

UNIT-III	**9 Hrs**

Character Arrays and Strings: Declaring and initializing string variable, Reading strings from terminal, Writing strings to screen, String handling functions, Table of strings

Modular Programming with User Defined Functions: Need for user-defined functions, Elements of user-defined functions, Definition of functions, Return values and their types, Function calls, Function declaration, Category of functions, Nesting of functions Recursion, The scope, visibility and lifetime of variables (storage classes)

UNIT-IV	**9 Hrs**

Structures and Unions: Defining a structure, Declaring and initializing structure variables, Accessing structure members, Array of structures, Structures within structures, Unions

Pointers: Understanding pointers, Declaring and initializing pointer variables, Pointer expressions, Pointers and arrays, Pointers and character strings, Pointers to functions, Pointers and structures, Aarray of pointers

File Management in C: Defining and opening a file, Closing a file, Input and output operations on sequential text files, Random access to files

Textbook(s):

1. E. Balagurusamy, *Programming in ANSI C*, 8th ed., New Delhi, India: McGraw Hill Education (India), 2022

Reference Book(S):

1 P. Deitel and H. Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, 9th ed., Harlow, England: Pearson Education Limited, 2022

2 B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd ed., New Delhi, India: Pearson Education India, 2015
3 R. Thareja, *Programming in C*, 3rd ed., New Delhi, India: Oxford University Press, 2023
4 Y. Kanetkar, *Let Us C*, 19th ed., New Delhi, India: BPB Publications, 2022
5 A. K. Sharma, *Computer Fundamentals and Programming in C*, 2nd ed., Hyderabad, India: Universities Press, 2018

Web and Video link(s):

1. https://nptel.ac.in/courses/106105171 *NPTEL Video Lecture on Problem Solving through Programming in C by Prof. Anupam Basu, Professor of CSE, IIT Kharagpur.*
2. https://nptel.ac.in/courses/106104128 *NPTEL Video Lecture on Introduction to Programming in C by Prof. Satyadev Nandakumar, Professor of CSE, IIT Kanpur.*

Course Articulation Matrix (CAM): U26ME103: PROGRAMMING FOR PROBLEM SOLVING WITH C

CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**U26ME103.1**	2	1	1	1	-	-	-	1	-	1	2	1	1
CO2	**U26ME103.2**	2	2	2	1	-	-	-	1	-	1	2	1	1
CO3	**U26ME103.3**	2	2	3	1	-	-	-	1	-	1	2	1	1
CO4	**U26ME103.4**	2	2	3	2	-	-	-	1	-	1	2	1	1
U26ME103		**2**	**1.75**	**2.25**	**1.25**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**1**	**1**

CO–SDG Alignment Matrix

CO	CO Statement *The student should be able to…*	Relevant SDG	SDG Description	Mapping Justification
CO1	enumerate programming development steps, design an algorithm and draw flow chart for a given application	SDG4	Quality Education	Writing a C program begins with understanding **algorithms and flowcharts** — these teach learners how to break any problem into logical, sequential steps before touching a keyboard. This systematic thinking is the essence of quality technical education. When a student declares a variable, assigns a data type, and uses printf() / scanf() for formatted I/O, they are learning how a computer receives, stores, and communicates information — skills directly applicable to any software career. Operators and expressions in C train students to translate real-world mathematical and logical problems into executable instructions. These concepts make C programming education a powerful vehicle for building digital literacy and technical competence, perfectly aligned with SDG 4's goal of ensuring inclusive, equitable, and quality education that equips youth with relevant skills for employment and life.
CO2	apply logical skills for problem solving using control structures and arrays	SDG9	Industry, Innovation and Infrastructure	In C programming, **control structures** like if-else and switch are the decision-making engines of every industrial software system — from automated assembly lines to embedded

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
				controllers in machines. for and while loops enable repetitive tasks such as reading data from sensors in a loop, continuously monitoring a system state, or iterating over a production dataset. **Arrays** in C allow storage and manipulation of large datasets in contiguous memory — a technique central to writing efficient firmware for industrial microcontrollers. **Linear search** in C is a direct implementation of the most basic data retrieval algorithm used in low-level embedded systems where advanced libraries are unavailable. Writing these constructs in C — a language used in 70%+ of critical infrastructure software — directly develops the skills that power industrial innovation and technological infrastructure, the heart of SDG 9.
CO3	develop string operations and modular programming with functions	SDG3	Good Health & Well-Being	In C, **character arrays and string functions** like strlen(), strcpy(), strcmp(), and strcat() are the primary tools for handling text-based patient data — names, diagnoses, prescriptions — in medical device firmware written in C. **User-defined functions** in C promote modular programming, where each function handles one specific task (e.g., calculate_bmi(), check_heartrate()), making medical software reliable, testable, and maintainable — critical in life-saving devices. **Recursion** in C is used in algorithms like binary search for patient records and tree traversal in medical data structures. **Storage classes** (auto, static, extern, register) control memory efficiently in embedded health devices like ECG monitors, pulse oximeters, and insulin pumps — where every byte of memory matters. C remains the dominant language in medical device programming, making this unit directly relevant to SDG 3.
CO4	Analyse and implement structures, unions, pointers and files in C programming	SDG11	Sustainable Cities & Communities	Advanced programming concepts such as data structures, pointers, and file handling form the foundation for developing reliable software systems and modern computing infrastructure In C, a struct groups related data under one

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
				name — for example, a struct citizen can hold name, ID, address, and utility usage together, exactly how urban management systems model real-world entities. Pointers in C enable dynamic and efficient memory access — critical in C programs that run on resource-constrained urban devices like smart meters, traffic signal controllers, and public transport embedded systems. Pointers to structures allow linked-list based data structures used in city-wide route management and network topology of infrastructure. File I/O in C using fopen(), fread(), fwrite(), and fclose() enables persistent data storage — logging power consumption, water usage, or traffic counts to files that city planners use for sustainable decision-making. union saves memory in embedded city devices by sharing memory across different data types. Together, these advanced C concepts are the building blocks of the embedded and systems software that makes smart, sustainable cities possible — directly supporting SDG 11.

ENGLISH COMMUNICATION AND REPORT WRITING

Class: B.Tech. I–Semesters		**Branch:** Common to all branches	
Course Code:	**U26MH104**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life

CO2 : create effective letters, e-mails, reply to Memos and do the given tasks with confidence

CO3 : analyze the given texts and write clear and unambiguous reports

CO4 : deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance

UNIT-I	**9 Hrs**

SPEAKING ACTIVITIES

Self-Introduction- News Paper Reading (reading aloud)-Pronunciation check-Presentation, Narration/ Oral Description of a story/incident/event with the clues (JAM)

GRAMMAR

Tenses: Definition and identification through examples-Main and Sub Tenses-Present Tense-Structures through examples-usage- Correct use of Tenses with a focus on Present Tense- exercises for practice

VOCABULARY

Word formation: Prefixes-Suffixes- Definition & Examples-Sentence Formation with newly

READING SKILL

Reading: Definition: Sub skills of Reading- Emphasis on Skimming-Definition-Purpose-How to skim through the text- Exercises for practice

WRITING PRACTICES

Report Writing: Definition-Purpose- Qualities of a good Report-Types-Format

Paragraph Writing: Definition-Organizing Principles of paragraphs-Making a paragraph through hints/graphs and pictures-Coherence-Linking Devices- Systematic Development of Ideas

LIFE SKILLS: Ethical Values and Humanity

The Last Leaf: A Short Story by O. Henry - Discussion based on collaborative interaction - Comprehension of Grammar, Vocabulary and Content

UNIT-II	**9 Hrs**

SPEAKING ACTIVITIES

Group Discussion-Narration/ Oral Description of a story/incident/event with the clues provided (JAM)--Debate

GRAMMAR

Tenses: Past Tense-Sub Tenses-Structures- Correct use of Past Tense- exercises for practice

Subject-Verb Agreement: Identification with examples-Rules-Exercises for practice

Reported Speech: Definition-Rules-Examples-Transformation Process-Exercises for practice

Sentence Correction: Emphasis on Concord, Reported Speech and Present and Past Tenses-Sentence Structures

VOCABULARY

Synonyms-Antonyms-Single-Word Substitutes- Definition-Examples-Popular Abbreviations

READING STRATEGY

Reading Strategy-Emphasis on Scanning the Text- Definition of Scanning-Purpose advantages- Examples, Exercises and Practice through Team work

WRITING PRACTICES

Report Writing:Technical Reports-Purpose-Format-significance of abstract/Executive Summary

Letter Writing: Effective Letter Writing Techniques-Information Seeking Letters-Job Application Letters- Apology Letters –Resume and Cover letter

LIFE SKILLS: Determination

How I Became a Public Speaker: An essay by George Bernard Shaw

Discussion based on collaborative interaction - Comprehension of Grammar, Vocabulary and Content

UNIT-III	**9 Hrs**

SPEAKING ACTIVITIES

Self-Introduction through videos- Narration/ Oral Description of a story/incident/event with the clues provided (JAM)- Poster presentations / Power-Point presentations

GRAMMAR

Tenses: Future Tense- Sub Tenses-Structures- Correct use of Future Tense- exercises for practice

Nouns-Prepositions-Adverbs-Adjectives-Definition-Identification-Exercises for practice

Sentence Correction based on correct use of Future Tense- Nouns- Prepositions-Adverbs – Adjectives

VOCABULARY

Phrasal Verbs- Technical Words-Latin Words

READINGS TRATEGY

Intensive Reading: purpose-Types of Comprehension Questions-Examples, Exercises and Practice through Team work

WRITING PRACTICES

Report Writing: Informational Reports- Inspection Reports –Feasibility Reports- Purpose - Format-Content-Exercises for Practice

LIFE SKILLS: **Positive Attitude**

Be the Best of Whatever You Are: A Poem by Douglas Malloch

Discussion based on collaborative interaction - Comprehension of Content

UNIT-IV	**9 Hrs**

SPEAKING ACTIVITIES

Extempore speech on the given topic- Visual Presentation- Group Discussion on the topic given well in advance- Providing the required inputs- Story telling of one's choice

GRAMMAR

Tenses: Revision-Exercises for Practice

Clauses: Definition-Identification through examples-Objective/Purpose- Types-Conjunctions-Transformation of Sentences

Sentence Correction (Based on Parts of Speech)-Clauses-Tenses

VOCABULARY

Appropriate Use of Words in Communication-Commonly Confused Words

ACTIVE READING and NOTE-MAKING

Note-Making-Definition-Purpose-Effectiveness

WRITING PRACTICES

Report Writing: Progress Report-Purpose- Format-Content-Exercises for Practice

Précis Writing: Definition-Purpose-Uses-Examples and Exercises-Practice through Teamwork

Preparing Statement of Purpose (SoP)

LIFE SKILLS: Emotional Balance

"A Poison Tree": Poem by William Blake

Discussion based on collaborative interaction - Comprehension of Content

Textbook(s):

1. Sanjay Kumar& Pushp Lata, "*English Language and Communication Skills for Engineers"* As per the latest AICTE syllabus, Oxford University Press, 1st edition 2018

2. "*Language and Life: A Skill's Approach*" Based on the latest AICTE model curriculum Orient Black swan Private Limited 2nd Edition 2019.

Reference Book(S):

1.Thomson A.J., Martinet A.V., "*A Practical English Grammar*", Oxford UniversityPress3rd Edition1997

2. Thomson A.J. Martinet A.V, "*A Practical English Grammar*" Exercise2, Oxford University Press3rd Edition1997
3. Standard Allen W., "*Living English Structure*", Pearson India Education Pvt Ltd.5th Edition 2009

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc20_hs56/Preview Technical English for Engineers by Ais haIcbal, IIT Madras
2. https://onlinecourses.swayam2.ac.in/cec21_lg13/preview Indian Writing in English by Dr. Bindu Ann Philip, St Mary's College Trissur

Course Articulation Matrix (CAM):		**U26MH104: ENGLISH COMMUNICATION AND REPORT WRITING**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	U26MH104.1	-	-	-	-	-	1	-	2	2	2	2	1	1
CO2	U26MH104.2	-	-	-	-	-	1	-	2	2	2	2	1	1
CO3	U26MH104.3	-	-	-	-	-	1	-	2	2	2	2	1	1
CO4	U26MH104.4	-	-	-	-	-	1	-	2	2	2	2	1	1
U26MH104		-	-	-	-	-	1	-	2	2	2	2	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life	SDG-3	Good health and well-being	This aligns with SDG-3 as it partially contributes to the negative impact of mental imbalance on health through the irrational fears of Johnsy who is certain of her death when the last leaf falls down
		SDG-5	Gender equality	This also aligns with SDG-5 as is highlights women accomplishments on par with men by exposing Johnsy and Sue as painters who come out of their home town to stay in another place and work along with men for societal exposure
		SDG-4	Quality education	This aligns with SDG-4 as its primary focus is on enhancing the quality of language in speech and writing by strengthening grammar, vocabulary and writing skills.
CO2	create effective letters, e-mails, reply to Memos and do the given tasks with confidence	SDG-4	Quality education Decent work and	This aligns with SDG-4 as its aim is to enhance reading and writing skills by helping students write letters and resumes effectively applying grammar rules and using relevant vocabulary

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
		SDG-8	economic growth	This aligns with SDG-8 as it indirectly contributes to economic growth and helps students become aware of the inevitability of strengthening their resume by improving their skills
CO3	analyze the given texts and write clear and unambiguous reports	SDG-4	Quality education	This aligns with SDG-4 as it focuses on enhancing the speaking, reading and writing skills of students to prove their abilities and the best communicators in society and work place by exhibiting professionalism in the usage of language
CO4	deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance	SDG-4 SDG-16	Quality education Peace, justice and strong institutions	This aligns with SDG-4 as it orientates the students towards reading and writing, and improves critical and critical thinking Though not completely, it aligns with SDG-16 as it emphasizes the need to give up anger which is the most potential enemy of man to enjoy peace and become morally strong

ENGINEERING MECHANICS

Class: B. Tech. I – Semester		**Branch:** Mechanical Engineering	
Course Code:	**U26ME105**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: analyze the action of forces on bodies using free body diagrams and force principles.

CO2 : determine the axial forces in pin-jointed structures under different loading conditions.

CO3: evaluate the geometrical properties and centroids of various cross-sections.

CO4: apply equilibrium and work-energy principles for solving dynamic engineering problems.

UNIT-I	**9 Hrs**

Introduction: Basic Definitions – Mass, Particles, Rigid Body, Time, Space, Force, Branches of Mechanics; Fundamental principles of Mechanics – Parallelogram and Triangle laws of Forces, Newton's laws of Gravitation and Motion, Laws of superposition and Transmissibility of Forces.

Force Systems: Types of forces, co-planar, concurrent and parallel forces, moment and couple, free body diagram, resultant of force systems, resolution of forces, composition of forces, equilibrium equations of forces, Lami's theorem, Varignon's theorem, moment equilibrium equations.

UNIT-II	**9 Hrs**

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction. Motion of Bodies, Wedge Friction, Screw Jack, and Differential Screw Jack**.**

Plane Trusses: Rigid truss, stability and determinacy conditions, basic assumptions for a perfect truss, analysis of trusses by method of joints and method of sections of a cantilever and simply supported statically determinate pin- jointed trusses.

UNIT-III	**9Hrs**

Centroid: Centroid of one-dimensional figures, centroid of simple figures from first principles, centroid of composite sections.

Moment of Inertia: Moment of inertia of plane sections from first principles, theorems of moment of inertia–parallel axis theorem and perpendicular axis theorem, moment of inertia of standard sections and composite sections

UNIT-IV	**9 Hrs**

Kinematics: Introduction to Dynamics, Rectilinear Motion of a particle – Displacement, Velocity and Acceleration, Motion with uniform Acceleration and Motion with variable Acceleration; Curvilinear Motion- Components of motion, Rectangular Components, Components of Normal and Tangential Acceleration.

Kinetics: Rectilinear motion-Equations of Rectilinear motion, Equations of Dynamic Equilibrium, D'Alembert's Principle; Curvilinear Motion-Equations of Motion in Rectangular components, Tangential and Normal Components, Equations of Dynamic Equilibrium; Applications of Work-Energy, Impulse –Momentum principles of Rectilinear Motion and Curvilinear Motion.

Textbook(s):

1. Tayal A.K., Engineering Mechanics: Statics and Dynamics, Umesh Publishers, 15th edition, 2020, New Delhi. (Chapter 1, 2, 3, 4, 6, 9, 12, 14,15,16 &17)

Reference Book(S):

1. Timoshenko S., Young D.H.,Rao J.V., and Sukumar Pati, Engineering Mechanics, McGraw-Hill Education Pvt. Ltd, 6th edition, 2021, New Delhi.
2. Bhavikatti S.S., Engineering Mechanics, New Age International, 5th edition, 2013(reprint), New Delhi.
3. Basudeb Bhattacharyya, Engineering Mechanics, Oxford University Press, 10th edition, 2020, New Delhi.
4. Subramanian R., Strength of Materials, Oxford University Press, 4th edition, 2021, New Delhi.
5. Ramamrutham S., Strength of Materials, Dhanpat Rai & Sons, 3rd edition, 2017, New Delhi.
6. Rajput R.K., Strength of Materials, S. Chand and Company, 8th edition, 2021, New Delhi.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_me79/preview; NPTEL video link for Engineering drawing and computer graphics By Prof. Rajaram Lakkaraju, IIT Kharagpur.

Course Articulation Matrix (CAM):		U26ME105 ENGINEERING MECHANICS												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26ME105.1	2	2	1	1	-	-	-	1	1	1	1	2	1
CO2	U26ME105.2	2	2	1	1	-	-	-	1	1	1	1	2	1
CO3	U26ME105.3	2	2	1	1	-	-	-	1	1	1	1	2	1
CO4	U26ME105.4	2	2	1	1	-	-	-	1	1	1	1	2	1
U26ME105		2	2	1	1	-	-	-	1	1	1	1	2	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyze the action of forces on bodies using free body diagrams and principles of mechanics.	SDG4	Quality Education	Strengthens the fundamental understanding of engineering mechanics and force analysis required for technical learning.
		SDG9	Industry, Innovation and Infrastructure	Provides the analytical foundation needed for the design and analysis of engineering structures and mechanical systems.
CO2	determine the axial forces developed in pin-jointed structures under various loading conditions.	SDG9	Industry, Innovation and Infrastructure	Supports the analysis and design of structural systems such as trusses used in industrial and civil engineering applications.
		SDG11	Sustainable Cities and Communities	Contributes to the development of safe and stable infrastructure systems for sustainable communities.
CO3	evaluate the geometrical properties and centroid locations of simple and composite cross-sections.	SDG9	Industry, Innovation and Infrastructure	Helps in the efficient design and analysis of engineering and structural components.
		SDG12	Responsible Consumption and Production	Encourages effective material utilization through proper sectional and geometrical analysis.
CO4	apply equilibrium equations and work–energy principles to solve engineering dynamics problems.	SDG4	Quality Education	Enhances problem-solving and analytical skills in engineering mechanics and dynamics.
		SDG9	Industry, Innovation and Infrastructure	Supports the study and analysis of dynamic systems used in mechanical and structural engineering applications.

ENGINEERING CHEMISTRY LABORATORY

Class: B. Tech. I– Semester		**Branch: ME**	
Course Code:	**U26CY106B**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: make use of analytical instruments for chemical analysis

CO2: determine water quality parameters - alkalinity, hardness

CO3: design synthesis of polymer and composites

CO4: measure viscosity, flash and fire point of a fuel

List of Experiments

1. Estimation of hydroxide ion by acidimetry
2. Estimation of alkaline species present in the given water sample
3. Determination of hardness of water by complexometric method
4. Determination of dissolved oxygen in water sample
5. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
6. Standardization of weak acid (acetic acid) by conductometry using sodium hydroxide (NaOH) and standard hydrochloric acid (HCl)
7. Standardization of strong acid (HCl) by potentiometry using standard sodium hydroxide (NaOH)
8. Kinematic and dynamic viscosity measurement of a given fuel/lubricating oil using Redwood viscometer/Saybolt apparatus
9. Flash and fire points of a given fuel using Cleveland's/Abel's apparatus
10. Carbon residue of a given fuel using Rams bottom apparatus
11. a. Synthesis of polymer (phenol- formaldehyde)
    b. Fabrication of polymer composite using hand layup technique and evaluate the defects of fabrication
12. Determination of resistance to wear rate of polymer composite in accordance with ASTM D1242 using pin on disc test rig

Textbook(s):

1. Mendham, J., Denney, R.C., Barnes, J.D. and Thomas, M.J.K., *Vogel's Textbook of Quantitative Chemical Analysis*, Pearson Education, 6th edition, 2009.
2. William D. Callister Jr & David G. Rethwisch, *Material Science Engineering*, 10th Edn., Wiley, 2018 (chapter 11)

Reference Book(s):

1. S. Agarwal, *Engineering Chemistry Fundamentals and Applications*. Cambridge University Press, May 23, 2019
2. Rajesh K., Prasad, Ojha T. P., *Non-Conventional Energy Sources,* 4th Edn., Jain Brothers, (Chapter 6)

Laboratory Manual:

1. *Engineering Chemistry Laboratory Manual for* ME, Department of PS, KITSW

Course Articulation Matrix (CAM):		U26CY106B: ENGINEERING CHEMISTRY LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26CY106B.1	2	1	-	-	-	1	1	-	1	-	1	1	1
CO2	U26CY106B.2	2	1	-	-	2	1	1	-	1	-	1	1	1
CO3	U26CY106B.3	2	1	-	-	2	1	2	1	1	-	1	1	1
CO4	U26CY106B.4	2	1	-	-	-	1	1	-	1	-	1	1	1
U26CY106B		2	1	-	-	2	1	1.25	1	1	-	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	CO Statement *The student should be able to*	Relevant SDG	SDG Description	Mapping Justification
CO1	make use of analytical instruments for chemical analysis	SDG9	Industry, Innovation and Infrastructure	Analytical instruments such as electrochemical analyzer's help in accurate chemical analysis and research. These techniques improve industrial quality control, product development, and technological innovation.
CO2	determine water quality parameters - alkalinity, hardness	SDG6	Clean water and sanitation	Determination of alkalinity and hardness is essential for assessing the suitability of water for drinking and industrial purposes. Monitoring these parameters helps in maintaining water quality and preventing health and environmental issues.
CO3	design synthesis of polymer and composites	SDG9	Industry, Innovation and Infrastructure	Design and synthesis of polymers lead to the development of advanced materials used in engineering, healthcare, packaging, and electronics. Polymer technology supports innovation, industrial applications, and sustainable product development.
CO4	measure viscosity, flash and fire point of a fuel	SDG7	Affordable and clean energy	Measurement of viscosity, flash point, and fire point helps in evaluating fuel quality, efficiency, and safety during energy production and utilization. These properties are essential for proper fuel handling and efficient combustion systems.

PROGRAMMING FOR PROBLEM SOLVING WITH C LABORATORY

Class: B. Tech. I – Semester		**Branch: ME**	
Course Code:	**U26ME107**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**24 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: develop programs using operators and decision making statements

CO2 : apply loops and arrays to develop a program of an application

CO3: implement string operations and develop modular programs using user-defined functions, recursion, and storage classes

CO4: develop programs using structures, unions, pointers and files

LIST OF EXPERIMENTS

Experiment-1
To develop the Programs using input output functions, operators (arithmetic, relational and conditional)
Experiment-2
To develop the Programs using operators (bit-wise, logical, increment and decrement)
Experiment-3
To develop the Programs using conditional control structures: if, if-else, nested if
Experiment-4
To develop the Programs using else if ladder, switch and goto statements
Experiment-5
To develop the Programs using loop control structures: while
Experiment-6
To develop the Programs using loop control structures: do-while and for
Experiment-7
To develop the Programs on one dimensional array and two-dimensional array
Experiment-8
To develop the Programs on String operations and string handling functions
Experiment-9
To develop the Programs on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes
Experiment-10
To develop the Programs using structures, unions, pointers to arrays and pointers to strings
Experiment-11
To develop the Programs using array of pointers and pointers to structures
Experiment-12
To develop the Programs on File operations and file handling functions for sequential text files

Text Book(s):

1. Balagurusamy, *Programming in ANSI C*, 8th ed., New Delhi, India: McGraw Hill Education (India), 2022

Reference Book(s):

1. P. Deitel and H. Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, 9th ed., Harlow, England: Pearson Education Limited, 2022
2. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd ed., New Delhi, India: Pearson Education India, 2015

3. R. Thareja, *Programming in C*, 3rd ed., New Delhi, India: Oxford University Press, 2023
4. Y. Kanetkar, *Let Us C*, 19th ed., New Delhi, India: BPB Publications, 2022
5. A. K. Sharma, *Computer Fundamentals and Programming in C*, 2nd ed., Hyderabad, India: Universities Press, 2018

Web and Video link(s):

1. https://nptel.ac.in/courses/106105171 *NPTEL Video Lecture on Problem Solving through Programming in C by Prof. Anupam Basu, Professor of CSE, IIT Kharagpur.*
2. https://nptel.ac.in/courses/106104128 *NPTEL Video Lecture on Introduction to Programming in C by Prof. Satyadev Nandakumar, Professor of CSE, IIT Kanpur*

Laboratory Manual (for Laboratory Component):

Programming for Problem Solving with C Laboratory Manual and Record Book, Department of ME, KITSW.

Course Articulation Matrix (CAM):		**U26ME107: PROGRAMMING FOR PROBLEM SOLVING WITH C LABORATORY**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26ME107.1**	1	1	1	1	1	-	1	1	1	-	2	1	1
CO2	**U26ME107.2**	1	2	2	2	1	-	1	1	1	-	2	1	1
CO3	**U26ME107.3**	1	2	3	2	1	-	1	1	1	-	2	1	1
CO4	**U26ME107.4**	1	2	3	2	1	-	1	1	1	-	2	1	1
U26ME107		**1**	**2.25**	**2.25**	**1.75**	**1**	**-**	**1**	**1**	**1**	**-**	**2**	**1**	**1**

CO–SDG Alignment Matrix				
CO	CO Statement The student should be able to…	Relevant SDG	SDG Description	Mapping Justification
CO1	develop programs using operators and decision making statements	SDG 4	Quality education	Unit I introduces the absolute fundamentals of programming — I/O, operators, and decision-making — which are the entry point to computational literacy for every learner. Mastering bitwise, relational, and conditional constructs develops precise logical thinking that SDG 4 promotes: inclusive, quality education that equips individuals with foundational digital skills relevant to today's economy.
CO2	apply loops and arrays to develop a program of an application	SDG 9	Industry, Innovation and Infrastructure	Control flow structures — branching and iteration — are the building blocks of every industrial software system. Switch-case logic powers embedded firmware, protocol handlers, and state machines used in industrial automation. Loop constructs drive data processing pipelines, sensor polling, and real-time monitoring systems. These experiments

CO–SDG Alignment Matrix				
CO	CO Statement The student should be able to…	Relevant SDG	SDG Description	Mapping Justification
				develop the programming capability needed to build the innovative, reliable software infrastructure that SDG 9 calls for.
CO3	implement string operations and develop modular programs using user-defined functions, recursion, and storage classes	SDG 4	Quality education	Unit III marks the transition to structured, modular thinking — arrays, strings, functions, and recursion represent the intellectual leap from writing instructions to designing programs. Understanding parameter passing (by value vs address), scope via storage classes, and recursive decomposition develops higher-order analytical skills. This directly advances SDG 4's goal of fostering deep, transferable learning outcomes in technical education.
CO4	develop programs using structures, unions, pointers and files	SDG 9	Industry, Innovation and Infrastructure	Structures, pointers, and file handling are the cornerstones of systems-level and application programming used across industrial software. Structures model real-world entities in embedded systems and device drivers; pointer arithmetic is essential for OS kernel development and memory-efficient applications; file I/O enables persistent data storage in every production system. These skills directly contribute to building the robust digital infrastructure that SDG 9 envisions.

SPORTS & YOGA			
Class: B. Tech. I– Semester		**Branch:** Common to All Branches	
Course Code:	**U26VA108**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : Demonstrate Physical Fitness by performing Yoga Asanas.

CO2 : Demonstrate Physical Fitness through various games & Sports

CO3 : Demonstrate Sportsman spirit and ethics

CO4 : Demonstrate Physical, Psychological, Social and Emotional balance.

Event-1

BASKET BALL: Passing, Dribbling, Shooting, Blocking, Rebounding, Offense/ Defence.

Event-2

FOOT BALL : Dribbling, Passing, Receiving , Shooting ,Ball Control ,Heading ,Tracking Marking, Movement off the Ball.Develop a program to implement contrast stretching.

Event-3

VOLLEY BALL: Serving, Passing (upper hand / under hand), Setting, Blocking, Spiking

Event-4

BADMINTON : Proper Grip , Footwork, Stance, Serving, Basic Strokes.

Event-5

CHESS : Tactics, Calculation, Visualization, Opening, Evaluation ,Ending games, Strategy

Event-6

CARROMS : Proper Flicking technique, Angle Awareness, Controlling force, Focus and Consistency, Visualize the shot, Body Alignment and Posture, Watch your Wrist. Use the Right Finger.

Event-7

TABLE TENNIS : Grip, Stance, Footwork, Basic Stokes, Serving.

Event-8

CRICKET : Batting ,Bowling , Fielding ,Wicket Keeping.

Event-9

HAND BALL : Gripping, Catching Passing, Dribbling ,Faking, Shooting .

Event-10

KABADDI : Offensive (Raiding) Skills, Defensive (Tackling) Techniques.

Event-11

KHO-KHO : Chasing (Attacking) ,Running(Evading)Techniques.

Event-12

YOGA : Surya Namaskar, Thirkonasanam, Vajrasanam, Shashankasanam, Navukasanam, Chakrasanam, Dhanurasanam, Pranayamam.

Textbook(s):

1. Rules and Skills of Games and Sports, Author – B.K.Chaturvedi, Publisher – Goodwill Publishing House, B-9, Rattan Jyoti, 18 Rajendra Place, New Delhi – 110008 (India)
2. Yoga For Every Athlete, Secrets of an Olympic Coach, Author – Aladar Kogler, Ph.D., Sports Psychologist, JAICO Publishing House, Mumbai, Delhi, Bangalore, Calcutta, Hyderabad, Chennai.
3. Coaching Successfully BasketBall, Author – Yograj Thani, Sports Publication, WP-474, 1st Floor, Shiv Market, Ashok Vihar, Delhi-110052.
4. Badminton for Schools, AuthorJake Downey, Publisher – S.Chand & Company Ltd, Ram Nagar, New Delhi-110055.
5. Volleyball for Schools, Author- Dave James Phtographs by Gordon Ruck, Publisher – S.Chand & Company (Pvt) LTD, Ram Nagar, New Delhi – 110055.

6. FootBall Skills & Rules, Author – O.P.Sharma, Publisher- Khel Sahitya Kendra, 4264/3, Ansari Road, Darya Ganj, New Delhi-110002.

Reference Book(S):

1. Foundation of Physical Education and Sports, Dr.Sakure Girish Madhaorao,Sports Publication 7/26,Ground Floor,New Delhi-110002,E-mail:lakshaythani@hotmail.com.

Course Articulation Matrix (CAM):		U26VA108 : SPORTS & YOGA Common to All Branches												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26VA108.1	-	-	1	-	-	2	1	2	-	-	1	-	-
CO2	U26VA108.2	-	-	1	-	-	2	1	2	1	-	1	1	-
CO3	U26VA108.3	-	-	1	-	-	2	1	2	-	-	1	1	-
CO4	U26VA108.4	-	-	1	-	-	2	1	2	-	1	1	-	-
U26VA108.1		-	-	1	-	-	2	1	2	2	1	1	1	-
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	Demonstrate Physical Fitness by performing Yoga Asanas	SDG13, SDG5	Climate Action, Gender Equality	Promoting eco-friendly sports practices, minimal resource usage, outdoor yoga, and sustainable lifestyle habits. Promoting teamwork, leadership, inclusiveness, equal participation, and collaboration in sports and group yoga sessions.
CO2	Demonstrate Physical Fitness through various games & Sports	SDG3	Good Health & Well-being	Designing personalized fitness routines, yoga modules, and wellness programs to meet individual health needs.
CO3	Demonstrate Sportsman spirit and ethics	SDG16	Peace, Justice & Strong Institutions	Encouraging discipline, fairness, inclusivity, respect, mental balance, and ethical conduct through sportsmanship and yogic values.
CO4	Demonstrate Physical, Psychological, Social and Emotional balance	SDG3, SDG11	Good Health & Well-being, Sustainable Cities & Communities	Understanding the role of physical fitness and yoga in improving societal health, work-life balance, and community well-being.

ENGINEERING GRAPHICS & CAD

Class: B. Tech. I – Semester		**Branch:** Mechanical Engineering	
Course Code:	**U26ME109**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**1-0-4-5**	**CIE:**	**40%**
Total Number of Teaching Hours:	**72 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : draw geometrical constructions and projections of points and straight lines

CO2 : develop projections of straight lines and planes in different positions

CO3 : construct projections and sectional views of solids

CO4 : create orthographic and isometric drawings using conventional methods and AutoCAD

UNIT-I	**6+12 =18 Hrs**

Introduction: Importance of Engineering Drawing, principles of engineering drawing, Lettering, types of lines, dimensioning and geometrical constructions.

Projection of Points: Introduction to orthographic projections-Vertical Plane, Horizontal plane; Views-Front view, Top view, and Side view; Projection of Points-different quadrants.

Projection of Straight Lines – I: Projections of lines parallel to both reference planes, lines parallel to one plane and perpendicular to the other, and lines parallel to one plane while inclined to the other reference plane.

UNIT-II	**6+12 =18 Hrs**

Projection of Straight Lines – II: Projections of lines inclined to both the reference planes and determination of traces.

Projection of Planes: Projections of planes parallel, perpendicular, inclined, and oblique to the reference planes.

UNIT-III	**6+12 =18 Hrs**

Projection of Solids: Types-prisms, pyramids, cylinders, and cones; Simple Positions-axis parallel to a reference plane and perpendicular to the other plane, axis parallel to one plane and inclined to the other reference plane; axis inclined to both the reference planes.

Sections of Solids: Section planes, sectional views, and determination of the true shape of sections of prisms and pyramids.

UNIT-IV	**6+12 =18 Hrs**

Orthographic projections: Conversion of isometric views into orthographic views. **Isometric Projections:** Isometric axis, Isometric Planes, Isometric View, Isometric projection, Construction of isometric view from orthographic views

Introduction to AutoCAD: Significance of AutoCAD, overview of the standard toolbar, draw, modify, dimension, and properties toolbars, and creation of simple orthographic and isometric drawings.

Textbook(s):

1. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.

Reference Book(S):

1. Shah M.B. & Rana B.C., Engineering Drawing and Computer Graphics, Pearson Education, 2008.
2. Agrawal B. & Agrawal C. M., Engineering Graphics, TMH Publication, 2012
3. Narayana K.L. & Kannaiah P, Text Book On Engineering Drawing, SciTech publishers (Corresponding Set of), 2008.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_me79/preview NPTEL video link for Engineering drawing and computer graphics By Prof. Rajaram Lakkaraju, IIT Kharagpur.

Course Articulation Matrix (CAM):		U24ME109 ENGINEERING GRAPHICS & CAD												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26ME109.1	2	1	1		-	-	1	1	1	1	1	1	1
CO2	U26ME109.2	2	1	1	1	-	-	1	1	1	1	1	1	1
CO3	U26ME109.3	2	1	1	1	-	-	1	1	1	1	1	1	1
CO4	U26ME109.4	2	1	1	1	2	-	1	1	1	1	1	1	1
U26ME109		2	1	1	1	1	-	1	1	1	1	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	Draw geometrical constructions and projections of points and straight lines.	SDG4	Quality Education	Engineering drawing develops visualization, graphical communication, and problem-solving skills essential for technical education and lifelong learning.
		SDG8	Work and Economic Growth	Drafting and drawing skills enhance employability and prepare students for careers in design, manufacturing, and engineering industries.
CO2	Develop projections of straight lines and planes in different positions.	SDG4	Quality Education	Learning projection techniques develops spatial visualization and problem-solving abilities essential for engineering education.
		SDG9	Industry, Innovation and Infrastructure	Projection of lines and planes forms the basis for engineering design and technical drafting used in industrial and infrastructure applications.
CO3	Construct projections and sectional views of solids.	SDG11	Sustainable Cities and Communities	Sectional views and solid projections support planning and visualization of structures, machines, and systems used in sustainable urban development
		`SDG9	Industry, Innovation and Infrastructure	Projection and sectioning techniques are widely used in product design, manufacturing, and industrial engineering processes.
CO4	Create orthographic and isometric drawings using conventional methods and AutoCAD.	`SDG9	Industry, Innovation and Infrastructure	AutoCAD and engineering graphics tools support digital product development, innovation, and modern industrial design practices.
		SDG8	Decent Work and Economic Growth	Knowledge of AutoCAD enhances professional skills and increases career opportunities in the engineering and design sectors.
		SDG4	Quality Education	The use of modern drafting software enhances technical competency and promotes practical learning in engineering education.

II SEMESTER (Stream – II)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	BSC	U26MH201	Matrix Theory and Vector Calculus	2	1	-	3	3
2	BSC	U26PY202B	Engineering Physics	2	1	-	3	3
3	ESC	U26ME203	Data Structures through C	2	1	-	3	3
4	ESC	U26EE204A	Basic Electrical & Electronics Engineering	2	1	-	3	3
5	PCC	U26ME205	Thermodynamics	2	1	-	3	3
6	BSC	U26PY206B	Engineering Physics Laboratory	-	-	2	2	1
7	ESC	U26ME207	Data Structures Through C Laboratory	-	-	2	2	1
8	ESC	U26EE208A	Basic Electrical & Electronics Engineering Laboratory	-	-	2	2	1
9	AEC	U26AE210	IDEA Lab Makerspace	-	-	2	2	1
			Total:	10	5	8	25	19
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)								

S. No.	Course Code	Course Title		S. No.	Course Code	Course Title
Pool – IX				**Pool – XI**		
1.	U26PY202A	Engineering Physics (for CE)		1.	U26PY206A	Engineering Physics Laboratory (for CE)
2.	U26PY202B	Engineering Physics (for ME)		2.	U26PY206B	Engineering Physics Laboratory (for ME)
3.	U26PY202C	Engineering Physics (for EEE/ECE/ECI)		3.	U26PY206C	Engineering Physics Laboratory (for EEE/ECE/ECI)
4.	U26PY202D	Engineering Physics (for CS/IT)		4.	U26PY206D	Engineering Physics Laboratory (for CS/IT)

Pool – X				Pool – XII		
1.	UU26EE204A	Basic Electrical & Electronics Engineering (for CE/ME)		1.	UU26EE208A	Basic Electrical & Electronics Engineering Laboratory (for CE/ME)
2.	UU26EE204B	Basic Electrical Engineering (for ECE/ECI)		2.	UU26EE208B	Basic Electrical Engineering Laboratory (for ECE/ECI)
3.	UU26EE204C	Basic Electrical Engineering (for EEE)		3.	UU26EE208C	Basic Electrical Engineering Laboratory (for EEE)
4.	UU26EE204D	Basic Electrical Engineering (for CS/IT)		4.	UU26EE208D	Basic Electrical Engineering Laboratory (for CS/IT)

Bridge Courses for exit:

Successful completion of two subjects (6-Credits) during 2-months internship at the institute
OR
Successful completion of two suitable skill based courses (external) to qualify for Certification

A. After First Year: (UG Certificate in ME)

(i) The candidate should pass any two of the following additional courses (ITI Level) during the 2-Months internship at institute

Exit Option to Qualify UG Certificate in ME: Any Two (02) Courses during the 2 - Months internship								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	PCC	U26ME212X	Internal Combustion Engines	**2**	**-**	**2**	**4**	**3**
2	PCC	U26ME213X	Machine Drawing & Modelling	**2**	**-**	**2**	**4**	**3**
3	PCC	U26ME214X	Basic Mechanical Engineering	**2**	**-**	**2**	**4**	**3**
4	PCC	U26ME215X	Any other course approved by BoS Chair and Dean AA	**2**	**-**	**2**	**4**	**3**

(OR)

(ii) Any two suitable skill based courses to qualify for Certification.

Exit Option to Qualify UG Certificate in ME: Any Two (02) Skill based Courses -:								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	SEC	U26SE212X	Certificate course in Product Design and Development (Offered by MSME CITD)	**-**	**-**	**6**	**6**	**3**
2	SEC	U26SE213X	Foundry men (NSQF)	**-**	**-**	**6**	**6**	**3**
3	SEC	U26SE214X	Mechanic Diesel (NSQF)	**-**	**-**	**6**	**6**	**3**
4	SEC	U26SE215X	Certificate Course in Product Design and Manufacturing (CITD)	**-**	**-**	**6**	**6**	**3**
5	SEC	U26SE216X	Any other skill based course approved by BoS Chair and Dean AA	**-**	**-**	**6**	**6**	**3**

MATRIX THEORY AND VECTOR CALCULUS			
Class: B. Tech. II – Semester		**Branch:** Common to all branches	
Course Code:	**U26MH201**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: analyze eigen value problems using matrix theory

CO2 : apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems

CO3: apply differential operators on vector and scalar point functions

CO4: solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems

UNIT-I	9 Hrs

Matrices:

Rank of a Matrix, Elementary transformations of a matrix, Gauss Jordan method of finding the inverse, Normal form of a matrix, Consistency of linear system of equations, System of linear homogenous equations, Eigen values, Eigen vectors, Properties of Eigen values, Cayley Hamilton's theorem, Reduction to diagonal form, Factorization method (LU Decomposition)
Applications of Eigen value problems: Stretching of an elastic membrane, Eigen value problems arising from Markov processes, Eigen value problems arising from population models, Leslie model

UNIT-II	9 Hrs

Multiple Integrals and Beta, Gamma functions:

Double Integrals, change of order of integration, Double Integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Volumes of solids, Calculation of Mass for a plane lamina, Beta function, Gamma function, Relation between Beta and Gamma functions (without proof)

UNIT-III	9 Hrs

Vector Calculus and its applications: - Vector Space, Linear dependent and independent vectors, Differentiation of vectors, Curves in space, Tangent, Principal normal, Binormal, Curvature, Torsion, Velocity and acceleration, Scalar and vector point functions, Del applied to scalar point functions - Gradient, Geometrical interpretation, Directional derivative, Del applied to vector point functions -Divergence, Curl, Physical interpretation of divergence, Physical interpretation of curl, Del applied twice to point functions, Del applied to products of point functions, Decomposition of vector valued functions

UNIT-IV	9 Hrs

Integration of vectors:

Line integral, Surfaces-Surface integral, flux across a surface, Green's theorem in the plane (without proof), Stoke's theorem (Relation between line and surface integrals) (without proof), Volume integral, Gauss divergence theorem (Relation between surface and volume integrals) (without proof), irrotational fields, solenoidal fields

Textbooks:

1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017(Chapters 2,7,8)
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John Wiely &sons, 10th edition, 2020 (Chapter 8(8.2))

Reference Book(S):

1. Spiegel M, *Vector Analysis* -Schaum's Series, McGraw Hill, 2nd edition, 2017
2. S.S. Sastry, *Engineering Mathematics, Vol.II,* Prentice Hall of India, 3rd edition, 2014.
3. Gilbert Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 5th edition

Web and Video link(s):

1. https://youtu.be/L4crGhtEX14?si=hyjAPgDheJOhXtYZ : *NPTEL Video Lecture on Matrix Analysis with Applications/Dr.S.K.Gupta and Dr.Sanjeev Kumar/IIT Roorkee*
2. https://youtu.be/ksS_yOK1vtk?si=CNNA58OIuszubPiX : *NPTEL Video Lecture on Integral and Vector Calculus./Prof.Hari Shankar Mahato / IIT Kharagpur*

Course Articulation Matrix (CAM):		U26MH201 MATRIX THEORY AND VECTOR CALCULUS												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26MH201.1	2	2	1	1	-	-	-	1	1	-	1	1	1
CO2	U26MH201.2	2	2	1	1	-	-	-	1	1	-	1	1	1
CO3	U26MH201.3	2	2	1	1	-	-	-	1	1	-	1	1	1
CO4	U26MH201.4	2	2	1	1	-	-	-	1	1	-	1	1	1
U26MH201		**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyze eigen value problems using matrix theory	SDG4	Quality Education	If the work focuses on mathematical learning, computational methods, or improving higher education and research in mathematics and engineering.
CO2	apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems	SDG9	Industry, Innovation and Infrastructure	Multiple integrals are applied in engineering fields such as fluid mechanics, thermodynamics, and structural analysis to evaluate physical quantities in real-world systems. In Computer Science and Engineering (CSE) and AI & ML, they are used in image processing, computer graphics, data modeling, probability distributions, and optimization techniques.
CO3	apply differential operators on vector and scalar point functions	SDG9	Industry, Innovation and Infrastructure	Applying differential operators on scalar and vector point functions is essential in fluid dynamics, electromagnetism, engineering analysis, and computational modeling. These mathematical tools are widely used in scientific research, technological development, and modern engineering applications.
CO4	solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems	SDG9	Industry, Innovation and Infrastructure	Line, surface, and volume integrals along with Green's, Stoke's, and Gauss divergence theorems are widely used in engineering, fluid mechanics, electromagnetics, and computational science. In Computer Science and Engineering, these concepts are applied in computer graphics, image processing, simulation techniques, artificial intelligence, and data visualization.

ENGINEERING PHYSICS			
Class: B. Tech. II– Semester		**Branch:** ME	
Course Code:	**U26PY202B**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**60%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**40%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : analyse crystal structures, Bravais lattices, Miller indices, crystal defects, the principle of X-ray diffraction and static and dynamic characteristics of measuring instruments.

CO2 : apply principles of oscillations, resonance and frictional phenomena (ladder and Wedge friction) to solve engineering problems.

CO3 : determine centroid, moment of inertia and radius of gyration of engineering sections; analyse laser generation principles and evaluate industrial applications of lasers in welding, drilling, cutting and precision manufacturing.

CO4 : evaluate solar photovoltaic cell and module performance using I-V characteristics, fill factor, efficiency and environmental effects; analyse stand-alone and grid-connected PV systems.

UNIT-I	**9 Hrs**

Characteristics of Instruments:
Static characteristics- range and span, accuracy, error and correction, calibration, hysteresis, drift, sensitivity, resolution, precision, repeatability and reproducibility, linearity. Dynamic characteristics- speed of response, measuring lag, fidelity, dynamic error, overshoot and dead time; Linear measurement: Vernier calliper and micrometre, error analysis.

Crystallography: Space lattice and unit cell; crystal structure and crystal systems, Bravais lattices, atomic packing factor (APF); crystal planes and directions, Miller indices, Interplanar spacing, Bragg's Law, X-ray Diffraction (XRD) and their applications in crystal structure determination; Crystal imperfections- point defects, line defects and surface defects; effect of defects on density.

UNIT-II	**9 Hrs**

Oscillations: equation of Simple Harmonic Motion (SHM); amplitude, frequency, phase and period; energy in SHM; superposition of SHMs; Damped and Forced Oscillations- Underdamped, critically damped and overdamped systems; forced oscillations; resonance; sharpness of resonance; quality factor (Q-factor); Mechanical Oscillatory Systems- spiral spring, Torsional pendulum, Cantilever, Bi-filar suspension; electrical vs mechanical oscillating systems analogy.

Friction: Introduction to friction; classification of friction; laws of friction; coefficient of friction; angle of friction; ladder friction; wedge friction; engineering applications.

UNIT-III	**9 Hrs**

Centroid, Radius of gyration and Moment of Inertia: Centroid and centre of gravity; centroid of rectangle, triangle and circle; composite sections; I-section and T-section; Moment of Inertia (MOI)-Definition; second moment of area; MOI of rectangle, circle and triangle; parallel axis theorem; perpendicular axis theorem; MOI of I and T sections; radius of gyration.

Lasers Fundamentals and Industrial applications: characteristics of laser; absorption; spontaneous emission; stimulated emission; population inversion; pumping methods; optical resonator; types of lasers-Ruby laser, He-Ne laser,CO_2 laser, diode laser (qualitative characteristics and uses); industrial applications of Lasers: laser welding- principle, advantages and applications in automotive and aerospace industries; Laser drilling-principle, advantages and applications in micro-machining, laser cutting- surface hardening and heat treatment, laser marking and engraving, medical and communication applications (qualitatively).

UNIT-IV	**9 Hrs**

Solar Cell Fundamentals: Introduction to solar energy; semiconductor materials; photovoltaic effect; operation of a solar cell, types of solar cells; Performance parameters of a single crystal solar cell- Short circuit current, Open circuit voltage, Fill factor and efficiency; I-V characteristics; influence of insolation, temperature and environmental factors.

Solar PV Module and Systems: Working principle of solar panels, Series and parallel connection of PV modules, Cell mismatch in a module, Solar array; PV systems for power generation- Stand alone and Grid alone PV systems, Applications- Street lighting, Water pumping, Refrigeration and telecommunications.

Textbook(s):

1. V.D. Kodgire, Material Science & Metallurgy, 42nd Edn., Everest Publishing House, Pune, 2018
2. Beer & Johnston, Mechanics of Materials, 7th Edn., McGraw-Hill, 2015.
3. M. Avadhanulu and Kshirsagar, TVS Arun Murthy, A Text Book of Engineering Physics, S. Chand & Company Ltd, 11th Edn.,2018
4. Rajesh K., Prasad, Ojha T. P., Non-Conventional Energy Sources, 4th Edn., Jain Brothers, 2014

Reference Book(S):

1. D. S. Kumar, Mechanical Measurements & Control, 5th Edn., Metropolitan Book Co. Pvt. Ltd, 2015
2. Tayal A.K., Engineering Mechanics: Statics and Dynamics, 14th Edn., New Delhi: Umesh Publishers, 2014
3. G.D. Rai., Solar Energy Utilization, 5th Edn., Khanna Publishers, 1997
4. D. Halliday, R. Resnick, and J. Walker, Fundamentals of Physics, 10th Edn., Hoboken, NJ, USA: Wiley, 2013
5. A.K. Katiyar, C.K. Pandey, Engineering Physics Theory and Practical, Wiley India Pvt. Ltd., 2nd Edn., 2017.

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc24_ph26/preview, *NPTEL video lecture on Solar Photovoltaics Fundamentals, Technology and Applications by Prof. Soumitra Satapathi, IIT Roorkee*
2. https://onlinecourses.nptel.ac.in/noc24_mm28/preview, *NPTEL video lecture on Defects in Crystalline Solids (Part - I) by Prof. Shashank Shekhar, IIT Kanpur*
3. https://onlinecourses.nptel.ac.in/noc24_ph45/preview, *NPTEL video lecture on Introduction to LASER by Prof. M. R. Shenoy, IIT Delhi*

Course Articulation Matrix (CAM):		U26PY202B – ENGINEERING PHYSICS												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26PY202B.1	2	2	2	2	1	-	1	-	1	-	1	1	1
CO2	U26PY202B.2	2	2	2	2	1	1	1	1	1	-	1	1	1
CO3	U26PY202B.3	2	2	2	1	1	1	1	-	1	-	1	1	1
CO4	U26PY202B.4	2	1	2	2	1	2	1	-	1	-	1	1	1
U26PY202B		**2**	**1.75**	**2**	**1.75**	**1**	**1.33**	**1**	**1**	**1**	**-**	**1**	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyse crystal structures, Bravais lattices, Miller indices, crystal defects, the principle of X-ray diffraction and static and dynamic characteristics of measuring instruments.	SDG 9	Industry, Innovation and Infrastructure	Crystal structure analysis, XRD and defect engineering support advanced materials and manufacturing technologies.
CO2	apply principles of oscillations, resonance and frictional	SDG 9 & SDG	Industry, Innovation and	Oscillation and friction concepts are fundamental to machine

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
	phenomena (ladder and Wedge friction) to solve engineering problems.	4	Infrastructure & Quality Education	design, vibration control and engineering education.
CO3	determine centroid, moment of inertia and radius of gyration of engineering sections; analyse laser generation principles and evaluate industrial applications of lasers in welding, drilling, cutting and precision manufacturing	SDG 9	Industry, Innovation and Infrastructure	Laser-based manufacturing, welding and drilling are key technologies in Industry 4.0 and precision engineering.
CO4	evaluate solar photovoltaic cell and module performance using I-V characteristics, fill factor, efficiency and environmental effects; analyse stand-alone and grid-connected PV systems.	SDG 7 & SDG 13	Affordable and Clean Energy & Climate Action	Solar PV systems contribute directly to clean energy adoption and climate action.

DATA STRUCTURES THROUGH C

Class: B. Tech. – II Semester		**Branch: ME**	
Course Code:	**U26ME203**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities

CO2 : analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities

CO3 : analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities

CO4 : develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies

UNIT-I	**9 Hrs**

Data Structures: Basic terminology, Classification of data structures, Applications and operations on data structures, Time and space complexity

Arrays: Operations on arrays-traversing an array, Inserting an element in an array, Deleting an element from an array, Searching an element using binary search and their complexities

Dynamic Memory Allocation: Memory allocation functions, Dynamic memory allocation for single and two dimensional arrays, Three dimensional and n-dimensional arrays, Passing arrays to functions and pointers

UNIT-II	**9 Hrs**

Stacks: Stacks, Array representation of stacks, Operations on a stack–push and pop, Multiple stacks, Applications of stacks- recursion, Fibonacci series, Tower of Hanoi, Evaluation of expressions (Infix to postfix conversion, Evaluation of postfix expression) Queues: Queues, Array representation of queues, Double ended queues, Circular queues

Queues: Queues, Array representation of queues, Double ended queues, Circular queues Priority Queue

UNIT-III	**9 Hrs**

Linked Lists: Basic terminologies, Linked list versus arrays, Memory allocation and de-allocation for a linked list, Singly linked list, Circular linked list, Doubly linked list, Circular doubly linked list (Linked list operations- traversing, searching, inserting, deleting), Representing stack and queue using linked list, Skiplist

UNIT-IV	**9 Hrs**

Sorting Techniques: Selection sort, Insertion Sort, Shell sort and Radix sort, Time complexities of sorting, Two way insertion sort, Comparison of sorting techniques

Hashing: Hashing techniques, Collision resolution techniques, Closed hashing, Open hashing, Comparison of collision resolution techniques

Textbook(s):

1. D.Samantha, *Classic Data Structure,* Prentice Hall India New Delhi, 2nd edition, 2009

Reference Book(s):

1. R. Thareja, *Data Structures Using C,* Oxford University Press, New Delhi, India, 2nd edition, 2014.
2. E. Balagurusamy, *Data Structure Using C*, McGraw Hill Education, New Delhi, India: 1st edition, 2017
3. R. F. Gilberg and B. A. Forouzan, *Data Structures: A Pseudocode Approach with C*, Cengage Learning, Boston, MA, USA, 2nd edition 2007

Web and Video link(s):

https://nptel.ac.in/courses/106106130 NPTEL Video Lecture on Programming and Data Structures Dr. N. S. Narayana Swamy, CSE, IIT Madras

Course Articulation Matrix (CAM):		U26ME203 : DATA STRUCTURES THROUGH C												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26ME203.1	2	2	2	1	-	-	1	-	1	-	1	1	2
CO2	U26ME203.2	2	2	2	2	-	-	1	-	1	-	2	1	2
CO3	U26ME203.3	2	2	2	2	-	-	1	-	1	-	2	1	2
CO4	U26ME203.4	2	2	2	2	-	-	1	-	1	-	2	1	2
U26ME203		2	2	2	1.75	-	-	1	-	1	-	1.75	1	2
3 – HIGH, 2 – MEDIUM, 1 – LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities	SDG 4	Quality education	Unit I introduces foundational thinking skills — algorithmic analysis, complexity trade-offs, and memory management — that are core to inclusive, quality technical education (SDG 4). Teaching students *how to reason about efficiency* equips them with problem-solving competencies that transcend programming languages and support lifelong learning in computing.
CO2	analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities	SDG 9	Industry, Innovation and Infrastructure	Stacks and queues are the structural backbone of real-world software infrastructure — OS process scheduling, compiler design (infix→postfix parsing), undo/redo systems, and network packet buffering. Recursion and the Tower of Hanoi build the algorithmic innovation skills that drive SDG 9's goal of fostering resilient, modern industrial systems through technology.
CO3	analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities	SDG 4	Quality education	Linked lists require students to reason about pointer manipulation, memory deallocation, and abstract data representation — demanding higher-order thinking that reflects SDG 4's emphasis on deep, quality learning. The progression from arrays to dynamic structures builds adaptable knowledge, and topics like skip lists and merging extend learners toward self-directed inquiry beyond the classroom.
CO4	develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies	SDG 9	Industry, Innovation and Infrastructure	Sorting and hashing are workhorses of industry-grade systems — database indexing, search engines, cryptographic hashing, and load balancing all rely on these techniques. Collision resolution directly models the design challenges engineers face building scalable, fault-tolerant infrastructure. This unit's focus on performance trade-offs and real-world applicability aligns strongly with SDG 9's innovation and infrastructure mandate.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Class: B. Tech. II – Semester		**Branch:** ME	
Course Code:	**U26EE204A**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : apply network reduction, Kirchhoff's laws, nodal and mesh analysis to determine resistance, voltage, current & power in electrical circuits

CO2 : evaluate impedance, voltage, current, and power in 1- Ø AC circuits & determine line and phase quantities in 3- Ø AC circuits

CO3 : select a suitable electrical machine for the given applications

CO4 : determine the voltage and current characteristics of diodes and transistors

UNIT-I	**9 Hrs**

DC circuits: Network elements, Linear & non-linear elements, Active & passive elements, Unilateral & bilateral elements, Ohm's law, Power, Energy, Kirchhoff's laws, Resistances connected in series and parallel, Voltage divider rule & Current divider rule

DC Circuit analysis: Source trans formation, Mesh analysis & Nodal analysis

UNIT-II	**9 Hrs**

1-Ø AC circuits: R.M.S value, Average value, Peak factor and form factor of a sine wave, Concept of phasor, Phase and phase difference, Rectangular and polar form representation, Sinusoidal steady state analysis of R, L, C, Series RL, RC, RLC circuits, Concept of reactance, Impedance, Complex power, Real power, Reactive power and Power factor

3- Ø AC circuits: Generation of 3- Ø voltages, Advantages, Disadvantages, Applications of three phase system, Voltage & Current relationships of line and phase values for balanced star and delta connections

UNIT-III	**9 Hrs**

Electrical Machines (Qualitative treatment): Construction, Principle of operation & applications of 1-Ø transformer, 1-Ø induction motor, DC motor, Stepper motor, and BLDC motor

Energy calculations: Elementary calculations of energy consumption, (domestic applications)

UNIT-IV	**9 Hrs**

Diodes: P-N Junction diode, volt-amp characteristics, Zener diode, volt-amp characteristics, Half-wave rectifier and Full-wave rectifier (centre-tapped),

Transistors: Bi-polar Junction Transistor symbol, operation of N-P-N and P-N-P transistors, Characteristics of BJT (CE, CB & CC configurations), Applications of diodes and transistors

Textbook(s):

1. K. Uma Rao, *Basic Electrical Engineering*, 5th ed., 2011, Pearson Education, Delhi. (Part-I-*Chapters 1 to 5, Part-II-Chapters 1 to 4 and 7*)
2. S Salivahanan & N Suresh Kumar, *Electronic Devices and Circuits*, 5th ed., 2006, Tata McGraw Hill, Delhi. (*Chapters 1 to 3*)

Reference Book(S):

1. B.L.Thereja, A.K.Thereja, *Electrical Technology Vol. I & II*, 2005, S.Chand & Company Ltd.
2. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, 3rd ed., 2009, Tata McGraw Hill, Delhi.

Web and Video link(s):

https://nptel.ac.in/courses/108105112; *Fundamentals of Electrical Engineering, by Prof. Debapriya Das, Professor, IIT Kharagpur*.

Course Articulation Matrix (CAM):		U26EE204A: BASIC ELECTRICAL & ELECTRONICS ENGINEERING												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26EE204A.1	3	3	1	1	1	–	–	–	1	1	1	2	1
CO2	U26EE204A.2	3	3	1	1	1	–	–	–	1	1	1	2	1
CO3	U26EE204A.3	2	2	1	1	1	–	–	–	1	1	2	2	1
CO4	U26EE204A.4	2	1	1	1	1	–	–	–	1	1	–	2	1
U26EE204A		2.5	2.25	1	1	1	–	–	–	1	1	1.33	2	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to…)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	Determine voltage, current & power in electrical circuits using network reduction techniques	**SDG 9**	Industry, Innovation and Infrastructure	Circuit analysis using Kirchhoff's laws, mesh/nodal analysis, and source transformation forms the foundation for designing efficient power distribution networks, supporting industrial infrastructure development.
CO2	Determine impedance, voltage, current, and power in 1-Ø AC circuits & determine line and phase quantities in 3-Ø AC circuits	**SDG 7**	Affordable and Clean Energy	AC circuit analysis (real power, reactive power, power factor) and three-phase systems are essential for efficient power transmission and distribution, directly enabling affordable and reliable energy access.
CO3	Determine the voltage and current characteristics of diodes and transistors	**SDG 9**	Industry, Innovation and Infrastructure	Understanding PN junction diodes, Zener diodes, and BJT characteristics is fundamental to modern electronics, enabling innovation in industrial control systems, communication devices, and power supplies.
CO4	Select a suitable electrical machine for the given applications	**SDG 7**	Affordable and Clean Energy	Selection of appropriate motors (1-Ø IM, DC motor, stepper, BLDC) and transformers improves energy efficiency in pumps, fans, EVs, and industrial drives. Renewable energy sources (solar PV, wind, bioenergy) covered in this unit directly support clean energy transition.

THERMODYNAMICS			
Class: B. Tech. II – Semester		**Branch:** ME	
Course Code:	**U26ME205**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: distinguish heat & work and determine energy transfer for a closed system

CO2: evaluate the performance of various thermodynamic devices by applying the steady flow energy equation (SFEE) and the second law of thermodynamics principles

CO3: estimate entropy change, availability, irreversibility, and second law efficiency for various processes

CO4: analyze the thermodynamic relations and performance of a gas turbine power plant

UNIT-I	9 Hrs

Fundamental Concepts: Introduction, units, types of systems, control volume, control mass, continuum, macroscopic and microscopic point of view thermodynamics, Thermodynamic state, property, process, cycle, Intensive and extensive properties; Heat and Work, Thermodynamic Equilibrium, point and path functions, cyclic process, reversibility, quasi static process, irreversible process, Zeroth law of Thermodynamics and its applications

First Law of Thermodynamics for closed systems: Statement of First Law, applications to closed systems- internal energy, enthalpy and specific heats; Processes of closed system-constant volume, constant pressure, isothermal, adiabatic and polytropic; P-V-T relations, Perfect and real gases, Joule-Thomson coefficient, inversion curve, Vander walls equation of state

UNIT-II	9 Hrs

First law applied to open system: Steady flow energy equation (SFEE); applications to thermodynamic devices- boiler, turbine, nozzle, compressor, pump, heat exchangers

Second Law of Thermodynamics: Limitations of the first law of thermodynamics, Kelvin-Planck Statement, Clausius statement, Equivalence of Kelvin and Clausius Statements, Heat engine, Heat pump, Refrigerator, relation between COP of Heat pump and Refrigerator, Reversibility, Irreversibility, Causes of irreversibility, Conditions for reversibility, Carnot cycle, Carnot theorem, Thermodynamic temperature scales

UNIT-III	9 Hrs

Entropy: Concept of Entropy, Clausius inequality, Entropy principle and its applications, property of entropy, entropy change in various processes, entropy change mechanism, entropy generation in open and closed systems, Entropy and Disorder, Third law of Thermodynamics

Availability: Available energy, unavailable energy, Available energy referred to a cycle, irreversibility, second law efficiency, Helmholtz and Gibbs' functions

UNIT-IV	9 Hrs

Thermodynamic Relations: Maxwell relations, coefficient of volume expansion, isothermal compressibility factor, T-ds Equations, difference in heat capacities, ratio of heat capacities, change in internal energy, entropy, and enthalpy equations

Gas Turbines: Classification; comparison between open and closed cycle gas turbine; deviation of actual gas turbine cycle from Brayton Cycle-Isentropic efficiencies of compressor and gas turbine; methods of improving thermal efficiencies of gas turbine power plant - reheating, regeneration, and inter-cooling; applications

Textbook(s):

1. Nag P.K., *Engineering Thermodynamics*, McGraw-Hill Education, 6th edition, 2017.

Reference Book(s):

1. Vanwylen G.J. and Sonntag R.E., *Fundamentals of Thermodynamics*, Wiley India Pvt. Ltd., 7th edition, 2009.
2. Yonus A Cengel and Michale A Boles, *Thermodynamics: an Engineering Approach*, McGraw Hill Education, 9th edition, 2019.
3. Mahesh M Rathore, *Thermal Engineering*, McGraw Hill Education, 2010.
4. Ganesan V., *Gas Turbines*, McGraw Hill Education, 3rd edition, 2018.

Web and Video link(s):

1. https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8; N*PTEL Video Lecture on Basic Thermodynamics by Prof. S. K. Som, Professor of Mechanical Engineering, IIT Kharagpur.*
2. https://nptel.ac.in/courses/112102255; *NPTEL Video Lecture on Thermodynamics by Prof. S. R. Kale, Professor of Mechanical Engineering, IIT Delhi.*

Course Articulation Matrix (CAM):		**U24ME205**					**THERMODYNAMICS**							
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U26ME205.1**	2	2	1	-	-	-	1	1	1	-	1	2	1
CO2	**U26ME205.2**	2	2	1	-	-	-	1	1	1	-	1	2	1
CO3	**U26ME205.3**	2	2	1	-	-	-	1	1	1	-	1	2	1
CO4	**U26ME205.4**	2	2	1	-	-	1	1	1	1	-	1	2	1
U26ME205		**2**	**2**	**1**	**-**	**-**	**1**	**1**	**1**	**1**	**-**	**1**	**2**	**1**

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	distinguish heat & work and determine energy transfer for a closed system	SDG 4	Quality Education	Develops fundamental thermodynamic knowledge and analytical skills essential for engineering education and energy system understanding.
CO2	evaluate the performance of various thermodynamic devices by applying the steady flow energy equation (SFEE) and the second law of thermodynamics principles	SDG 7	Affordable and Clean Energy	Promotes efficient energy conversion and performance improvement of thermodynamic systems for sustainable energy utilization.
CO3	estimate entropy change, availability, irreversibility, and second law efficiency for various processes	SDG 12	Responsible Consumption and Production	Encourages efficient energy usage, minimization of losses, and sustainable thermal system operation.
CO4	analyze the thermodynamic relations and performance of a gas turbine power plant	SDG 9	Industry, Innovation and Infrastructure	Supports advanced power generation technologies and industrial energy system optimization.

ENGINEERING PHYSICS LABORATORY			
Class: B. Tech. II – Semester		**Branch:** ME	
Course Code:	**U26PY206B**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**60%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**40%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 :	measure dimensions of specimens using Vernier callipers, screw gauge and Air wedge method; rigidity modulus of a wire and prepare BCC and FCC crystal models, demonstrating understanding of crystal geometry.
CO2 :	determine radius of gyration and moment of inertia using torsional pendulum, compound pendulum, and bi-filar suspension; find force constant of a spiral spring and Young modulus of a beam;
CO3 :	determine coefficient of friction using pin-on-disc machine and analyse factors influencing friction; determine slit width and wavelength of He-Ne laser using diffraction grating.
CO4 :	analyse I-V characteristics and performance parameters of solar PV modules connected in series and parallel; evaluate the effect of temperature and light intensity on solar PV panel performance.

List of Experiments

1. Determination of linear dimensions (wire diameter, sphere diameter, groove depth) using Vernier callipers and screw gauge; tabulation and error analysis.
2. Determination of surface roughness of thin surface using Air Wedge interference method.
3. Determination of force constant of a spiral spring using static method
4. Determination of young's modulus of rectangular beam by cantilever method
5. Determination of (a) rigidity modulus of a given wire and (b) moment of inertia of a ring using a torsional pendulum.
6. Determination of radius of gyration (k) using a compound pendulum.
7. Determination of coefficient of friction using pin on disc machine.
8. Determine the moment of inertial of a Bi-filar pendulum and verify the perpendicular axis theorem.
9. Determination of slit width using He-Ne laser.
10. Determination of wavelength of He-Ne laser-using transmission diffraction grating.
11. Performance parameters of a solar cell/PV module and effect of irradiance on I-V characteristics.
12. I-V characteristics of a solar PV module connected in series and parallel.

Textbook(s):

1. A Text Book of Engineering Physics, M. Avadhanulu and Kshirsagar, TVS Arun Murthy, S. Chand & Company Ltd, 11th Edn.,2018
2. *Engineering Physics Theory and Practical,* A.K.Katiyar, C.K.Pandey, Wiley India Pvt. Ltd, 2nd Edn., 2017

Reference Book(S):

1. *Advanced Practical Physics*, B.L. Worsnop and H. T. Flint, Khosla Publishing House, 2021
2. *Engineering Practical Physics,* S.L Kakani, Shubra Kakani, CBS Publishers, 2007
3. *Solar Energy Utilization*, G.D. Rai, Khana Publishers, 2019

Laboratory Manual (for laboratory component):

1. *Engineering Physics Laboratory Manual & Record Book,* Department of PS, KITSW

Course Articulation Matrix (CAM):		U26PY206B: ENGINEERING PHYSICS LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24PY206B.1	2	2	2	1	2	1	1	2	1	-	1	1	1
CO2	U24PY206B.2	2	2	2	2	2	1	1	2	1	-	1	1	1
CO3	U24PY206B.3	2	2	2	2	2	1	1	2	1	-	1	1	1
CO4	U24PY206B.4	2	1	2	2	2	2	1	2	1	-	1	1	1
U24PY206		2	1.75	2	1.75	2	1.25	1	2	1	-	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	CO Statement *The student should be able to*	Relevant SDG	SDG Description	Mapping Justification
CO1	measure dimensions of specimens using Vernier callipers, screw gauge and Air wedge method; rigidity modulus of a wire and prepare BCC and FCC crystal models, demonstrating understanding of crystal geometry.	SDG 9	Industry, Innovation and Infrastructure	Precision measurement using Vernier callipers and screw gauge, and understanding of crystal models, directly underpins materials characterisation and quality control in manufacturing — core functions of industrial infrastructure and innovation.
CO2	determine radius of gyration and moment of inertia using torsional pendulum, compound pendulum, and bi-filar suspension; find force constant of a spiral spring and Young modulus of a beam;	SDG 9 & SDG 4	Industry, Innovation and Infrastructure & Quality Education	Experimental analysis of oscillatory mechanical systems (pendulums, springs) builds the foundation for dynamic analysis in machine design, vibration control, and structural engineering. Hands-on experimentation also contributes to quality engineering education through skill development.
CO3	determine coefficient of friction using pin-on-disc machine and analyse factors influencing friction; determine slit width and wavelength of He-Ne laser using diffraction grating.	SDG 9 & SDG 7	Industry, Innovation and Infrastructure & Affordable and Clean Energy	Friction characterisation is essential for tribological design in mechanical systems, reducing energy losses. Laser diffraction experiments support optical metrology and photonics — technologies that enable precision manufacturing and laser-based energy systems.
CO4	analyse I-V characteristics and performance parameters of solar PV modules connected in series and parallel; evaluate the effect of temperature and light intensity on solar PV panel performance.	SDG 7 & SDG 13	Affordable and Clean Energy & Climate Action	Hands-on characterisation of solar PV modules equips students to evaluate and deploy renewable energy systems, directly contributing to affordable clean energy and reducing fossil fuel dependence — critical objectives for climate action.

DATA STRUCTURE THROUGH C LABORATORY

Class: B. Tech. II – Semester		**Branch:** ME	
Course Code:	**U26ME207**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**24 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity

CO2 : apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively

CO3: solve problems using various linked list representations for efficiently storing and retrieving the data

CO4: apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing techniques to retrieve the data very effectively

LIST OF EXPERIMENTS

Experiment-1

1. Program to implement initialization of array and perform traversal operations in both the directions.
2. Program to implement searching operation on array using Linear Search
3. Program to display the count of occurrences of every number in an array

Experiment-2

4. Program to implement searching operation on array using Binary Search
5. Program to implement insertion operation on array
6. Program to implement deletion operations on array

Experiment-3

7. Program to implement initialization of arrays and traversal operation with DMA
8. Program to implement matrix addition and subtraction with DMA
9. Program to implement matrix multiplication with DMA

Experiment-4

10. Program to implement stack operations
11. Program to convert infix expression into postfix

Experiment-5

12. Program to evaluate given postfix expression
13. Program to define recursive function to solve tower of hanoi puzzle
14. Program to display the Fibonacci series with the help of recursive function
15. Program to implement MultiStack

Experiment-6

16. Program to implement queue operations using arrays
17. Program to implement circular queue operations using arrays
18. Program to implement double ended queue operations using arrays

Experiment-7

19. Program to create single linked list and implement its operations

Experiment-8

20. Program to create circular linked list and implement its operations
21. Program to create double linked list and implement its operations

Experiment-9

22. Program to create circular double linked list and implement its operations

Experiment-10

23. Program to implement stack operations using linked list
24. Program to implement queue operations using linked list

Experiment-11
25. Program to implement selection sort 26. Program to implement insertion sort
Experiment-12
27. Program to implement shell sort 28. Program to implement radix sort 29. Program to implement hash table
Textbook(s): 1. D.Samantha, *Classic Data Structure,* Prentice Hall India New Delhi, 2nd edition, 2009
Reference Book(S): 1. R. Thareja, *Data Structures Using C,* Oxford University Press, New Delhi, India, 2nd edition, 2014. 2. E. Balagurusamy, *Data Structure Using C,* McGraw Hill Education, New Delhi, India: 1st edition, 2017 3. R. F. Gilberg and B. A. Forouzan, *Data Structures: A Pseudocode Approach with C*, Cengage Learning, Boston, MA, USA, 2nd edition 2007
Web and Video link(s): *https://nptel.ac.in/courses/106106130; NPTEL Video Lecture on Programming and Data Structures Dr. N. S. Narayana Swamy, CSE, IIT Madras*
Laboratory Manual (for Laboratory Component): *Data Structure Through C Laboratory Manual and Record Book,* Department of IT, KITSW.

Course Articulation Matrix (CAM):		**U26ME207: DATA STRUCTURE THROUGH C LABORATORY**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26ME207.1**	2	2	2	1	-	-	1	1	1	-	1	1	1
CO2	**U26ME207.2**	2	2	2	2	-	-	1	1	1	-	2	1	1
CO3	**U26ME207.3**	2	2	2	2	-	-	1	1	1	-	2	1	1
CO4	**U26ME207.4**	2	2	2	2	-	-	1	1	1	-	2	1	1
U26ME207		**2**	**2**	**2**	**1.75**	**-**	-	**1**	**1**	**1**	**-**	**1.75**	**1**	**1**

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity	SDG 4	Quality education	These experiments build core computational thinking — traversal, searching, and dynamic memory management. Comparing linear vs binary search introduces algorithmic reasoning and efficiency trade-offs, directly reflecting SDG 4's goal of equipping learners with relevant, practical technical skills. DMA-based matrix operations further develop disciplined, structured problem-solving essential for quality engineering education.
CO2	apply the linear data structures such as stacks and queues and perform various operations using	SDG 9	Industry, Innovation and Infrastructure	Stacks, queues, and expression evaluation are the structural foundation of compilers, OS schedulers, and runtime systems — real industrial infrastructure. Infix-to-

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
	LIFO or FIFO order respectively			postfix conversion mirrors how compilers parse code; queues model network packet management and CPU job scheduling. Recursion (Tower of Hanoi, Fibonacci) drives innovation in algorithm design, aligning strongly with SDG 9's emphasis on resilient, modern technological infrastructure.
CO3	solve problems using various linked list representations for efficiently storing and retrieving the data	SDG 4	Quality education	Linked list variants demand abstract thinking about pointers, dynamic memory, and node relationships — among the most cognitively demanding topics in undergraduate CS. Mastering singly, circular, doubly, and circular-doubly linked lists builds deep structural understanding, reflecting SDG 4's focus on high-quality, skill-building education. Reimplementing stacks and queues via linked lists reinforces conceptual reuse and flexible thinking.
CO4	apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing techniques to retrieve the data very effectively	SDG 9	Industry, Innovation and Infrastructure	Sorting algorithms and hash tables are indispensable in industry-grade systems — database query optimisation, search engine indexing, caching layers, and load balancers all depend on them. Radix sort is used in network routing; hash tables power key-value stores like Redis and DNS lookups. These experiments directly develop skills for building scalable, innovative digital infrastructure, the core of SDG 9.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY

Class: B. Tech. II – Semester		**Branch:** ME	
Course Code:	**U26EE208A**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : validate mesh and nodal analysis

CO2 : determine the impedance of the series RL, RC circuits

CO3 : determine the efficiency of transformer by conducting load test and verify Kirchoff's laws using PSPICE

CO4 : determine the characteristics of BJT and parameters of a rectifier circuit

List of Experiments

1. Verification of voltage divider rule and current divider rule
2. Verification of Mesh Analysis
3. Verification of Nodal Analysis
4. Determination of internal parameters of a choke coil
5. Impedance calculations and phasor representation of R-L series circuit
6. Impedance calculations and phasor representation of R-C series circuit
7. Load test on 1-phase transformer
8. Single phase bridge rectifier using R load
9. Zener diode as voltage regulator
10. Input and output characteristics of BJT
11. Verification of Kirchoff's laws using PSPICE / MATLAB
12. Interfacing Sensors with Arduino using TINKER CAD
    a. LED blinking
    b. IR Sensor
    c. Ultrasonic Sensor
    d. Voltage Sensor
    e. Current Sensor
    f. Speed Sensor

Textbook(s):

1. K. Uma Rao, *Basic Electrical Engineering*, 5th ed., 2011, Pearson Education, Delhi. (*Chapters 1 to 9*)
2. S Salivahanan & N Suresh Kumar, *Electronic Devices and Circuits*, 5th ed., 2006, Tata McGraw Hill, Delhi. (*Chapters 1 to 6, 8 to 13*)

Reference Book(S):

1. B.L.Thereja, A.K.Thereja, *Electrical Technology Vol. I & II*, 2005, S.Chand & Company Ltd.
2. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, 3rd ed., 2009, Tata McGraw Hill, Delhi.

Laboratory Manual (for laboratory component):

1. *Basic Electrical & Electronics Engineering Laboratory Manual*, Department of EEE, KITSW

Course Articulation Matrix (CAM):		U26EE208A: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY											
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26EE208A.1	3	3	2	2	1	-	-	-	2	2	-	2	1
CO2	U26EE208A.2	3	2	2	3	1	-	-	-	2	2	-	2	1
CO3	U26EE208A.3	2	2	3	2	3	-	-	-	2	2	-	2	1
CO4	U26EE208A.4	3	2	2	2	1	-	-	-	2	2	-	2	1
	U26EE208A	**2.75**	**2.25**	**2.25**	**2.25**	**1.5**	**-**	**-**	**-**	**2**	**2**	**-**	**2**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	validate mesh and nodal analysis along with voltage and current divider rules	**SDG 4**	Quality Education	Performing circuit analysis experiments builds foundational knowledge in electrical engineering, enhancing quality technical education and analytical skills.
CO2	determine the impedance of series RL and RC circuits and represent phasor diagrams	**SDG 9**	Industry, Innovation and Infrastructure	Impedance calculations and phasor analysis are essential for AC circuit design, power factor correction, and industrial electrical infrastructure development.
CO3	determine the efficiency of a single-phase transformer by load test and verify Kirchhoff's laws using PSPICE	**SDG 7** & **SDG 9**	Affordable and Clean Energy; Industry, Innovation and Infrastructure	Transformer efficiency testing promotes energy conservation (SDG 7); simulation using PSPICE / MATLAB encourages digital innovation in engineering (SDG 9).
CO4	determine the input-output characteristics of BJT and parameters of a rectifier circuit including zener diode as voltage regulator	**SDG 9**	Industry, Innovation and Infrastructure	BJT characteristics and rectifier circuits form the backbone of power supplies, sensor interfaces, and reliable electronic infrastructure for industrial applications.

IDEA LAB MAKERSPACE

Class: B. Tech. II– Semester		**Branch:** Common to all branches	
Course Code:	**U26AE210**	**Credits:**	**1**
Hours/Week (L-T-P-E):	**0-0-2-4**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to …

CO1 : develop technical skills such as 3D printing, Laser engraving, Wood carving and Robotics

CO2 : apply the techniques and principles of welding, carpentry and foundry to produce required prototype/model

CO3 : design and build a IoT based and PCB system for a given application

CO4 : engage in project-based learning which reinforces theoretical knowledge through practical application

S. No.	Creative Fabrication Technology	List of Experiments
1.	3D Printing	Prepare a key chain on 3D printer with the given dimensions
2.		Prepare a Spur Gear on 3D printer with the given dimensions
3.	Laser Engraving	Perform key chain by using CO_2 laser cutting machine
4.	Welding	Prepare a Single V-Butt joint on mild steel plates using AC arc welding machine
5.	CNC Wood Router	Perform wood carving using CNC (Computer numerical Control) Wood Router
6.	Carpentry	Prepare a half lap dovetail joint
7.	Foundry	Prepare a sand mould using single piece pattern
8.	Injection Moulding	Prepare a plastic product using Injection moulding machine
9.	Printed Circuit Board (PCB)	Design and fabricate a PCB (Printed Circuit Board) for a given application
10.	Internet of Things (IoT)	Measure the temperature and humidity by using DHT11 sensor and Arduino UNO
11.		Create a Smart Plant Watering System using IoT (Internet of Things) technology
12.	Robotics	Perform basic pick-and-place operation using robot
Course Project		• Students are required to create an affordable prototype as their final project for the end semester exam (ESE), based on the knowledge and skills acquired during the course. • Students have to present and submit their prototypes to demonstrate their ability to apply classroom learning practically, showcasing their creativity and technical aptitude.

Textbook(s):

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy., "*Elements of Workshop Technology*", Media Promoters and publishers Pvt. Ltd, India, Vol-I-2008 &Vol-II-2010.

Reference Book(S):

1. Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani, "Additive Manufacturing Technologies-3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" Springer Nature, 2nd Edition 2021.
2. R.S. Khandpur, "Printed Circuit Boards: Design, Fabrication, Assembly and Testing", New Delhi Tata Mc Graw Hill-2008.
3. Sudeep Mishra, Anandarupmukherjee and Arijit Roy, "Introduction to IoT", New Delhi: University Cambridge Press, 2021.

Laboratory Manual (for laboratory component):

Workshop practice laboratory manual & record book prepared by the faculty of department of Mechanical engineering, KITSW, Revised version 4, July-2026.

Course Articulation Matrix (CAM):		**U26AE210: IDEA Lab Makerspace**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U26AE210.1**	2	2	1	1	2	1	1	1	1	1	1	1	2
CO2	**U26AE210.2**	2	2	1	1	2	1	1	1	1	1	1	1	2
CO3	**U26AE210.3**	2	2	1	1	2	1	1	1	1	1	1	1	2
CO4	**U26AE210.4**	2	2	1	1	2	1	1	1	1	1	1	1	2
U26AE210		**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	develop technical skills such as 3D printing, Laser engraving, Wood carving and Robotics	SDG 4	Quality Education	Development of modern fabrication and automation skills enhances technical competency, creativity, innovation and employability of students through hands-on learning and skill-oriented education
CO2	apply the techniques and principles of welding, carpentry and foundry to produce required prototype/model	SDG 9	Industry, Innovation and Infrastructure	Practical exposure to manufacturing and prototyping techniques promotes industrial skills, innovation capability and infrastructure-oriented engineering practices required for sustainable industrial development
CO3	design and build a IoT based and PCB system for a given application	SDG 11	Sustainable Cities and Communities	IoT and embedded system development supports smart technologies, automation, efficient resource monitoring and sustainable solutions for modern industries & communities
CO4	engage in project-based learning which reinforces theoretical knowledge through practical application	SDG 8	Decent Work and Economic Growth	Project-based learning improves problem-solving, teamwork, innovation and practical engineering skills, preparing students for productive employment and entrepreneurship in emerging technologies

INTERNAL COMBUSTION ENGINES			
Class: B. Tech. II –Semester (Exit)		**Branch:** ME	
Course Code:	**U24ME212X**	**Credits:**	**3**
Hours/Week (L-T-P-E):	**2-0-2-4**	**CIE :**	**40 %**
Total Number of Teaching Hours:	**32 Hrs**	**ESE :**	**60 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: Classification, components and nomenclature of an IC Engine

LO2: valve timing diagram of SI and CI engines

LO3: performance parameters of an IC engine

LO4: fuel supply systems of an IC engine

THEORY COMPONENT

UNIT-I	**4 Hrs**

IC Engines: Basic engine components and nomenclature; classification of engines; Working principle of two and four stroke SI & CI engines, Valve and port timing diagrams of IC engines

UNIT-II	**4 Hrs**

Testing of IC Engines: Measurement of brake power, friction power and indicated power; indicator diagram, fuel and air consumption

UNIT-III	**4 Hrs**

IC Engine Characteristics: Mean effective pressure, specific fuel consumption, air-fuel ratio, mechanical, volumetric and thermal efficiencies, effect of clearance volume on volumetric efficiency, Heat balance sheet

UNIT-IV	**4 Hrs**

Fuel Supply Systems: SI Engines - carburetion, mixture requirements; calculation of air fuel ratio; types of carburetors; CI Engines - functional requirements of an injection system, injection pump and injector nozzle

LABORATORY COMPONENT

List of Experiments

1. Load test on conventional single-cylinder four-stroke Compression Ignition Engine with Brake Drum Dynamometer.
2. Heat Balance test on conventional single-cylinder four-stroke Compression Ignition Engine with Brake Drum Dynamometer.
3. Load test on conventional twin-cylinder, four-stroke Compression Ignition engine with hydraulic dynamometer.
4. Heat balance test conventional twin-cylinder, four-stroke, Compression Ignition engine with hydraulic dynamometer
5. Performance test on single-cylinder, four-stroke Compression Ignition engine with eddy current dynamometer with Variable Compression Ratio.
6. Valve Timing Diagram of a single-cylinder four-stroke, Compression Ignition Engine.
7. Morse test on four-stroke, four-cylinder Spark Ignition Engine.
8. Performance test on computer-aided single-cylinder four-stroke, Compression Ignition Engine with eddy current Dynamometer.

Textbook(s):

1. Ganesan V., *Internal Combustion Engines*, 4th ed., New Delhi: Tata McGraw-Hill, 2013. *(Chapters 1, 2,15,16)*
2. Mahesh M Rathore, *Thermal Engineering*, New Delhi: Mc Graw Hill, 2010.

Reference Book(s):

1. Heywood J.B., *Internal Combustion Engine Fundamentals*, revised edition, New Delhi: McGraw-Hill, 1988.
2. Colin Ferguson R., Allan Kirkpatrick T., *Internal Combustion Engines: Applied Thermo sciences*, 2nd ed., New Delhi: Wiley, 2001.
3. Gupta H.N., *Fundamentals of Internal Combustion Engines*, 2nd ed., New Delhi: PHI Pvt. Ltd., 2012.

4. Rajput R.K., *Text book on Internal Combustion Engines*, New Delhi: Laxmi publication Pvt. Ltd., 2013.

Web and Video link(s):

https://archive.nptel.ac.in/courses/112/103/112103262/; *NPTEL Video Lecture on IC Engines by Prof. Pranab K. Modal, Professor of ME, IIT Guwahati & Prof. Vinayak N Kulkarni, Professor of ME, IIT Guwahati.*

Laboratory Manual (for laboratory component):

2. *IC Engines laboratory manual,* Department of ME, KITSW

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: compare SI and CI Engines
CO2: evaluate the performance parameters
CO3: solve the numerical problems on IC engines Characteristics
CO4: analyse the fuel supply systems for SI and CI engines

(based on knowledge acquired from laboratory component)
CO5 : analyse characteristics of an SI engine
CO6 : evaluate performance Characteristics of an CI engine
CO7 : draw the valve timing diagram of a CI engine
CO8 : draw the heat balance sheet of an IC engine

Course Articulation Matrix (CAM)		U24ME212X INTERNAL COMBUSTION ENGINES												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24ME212X.1	-	-	1	-	-	1	1	1	1	1	1	1	1
CO2	U24ME212X.2	-	-	1	-	-	1	1	1	1	1	1	1	1
CO3	U24ME212X.3	1	2	1	-	2	1	1	1	1	1	1	1	1
CO4	U24ME212X.4	1	2	1	-	2	1	1	1	1	1	1	1	1
CO5	U24ME212X.5	-	-	1	-	-	1	1	1	1	1	1	1	1
CO6	U24ME212X.6	-	-	1	-	-	1	1	1	1	1	1	1	1
CO7	U24ME212X.7	1	2	1	-	2	1	1	1	1	1	1	1	1
CO8	U24ME212X.8	1	2	1	-	2	1	1	1	1	1	1	1	1
U24ME212X		**1**	**2**	**1**	**-**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

MACHINE DRAWING AND MODELLING			
Class: B.Tech. II-Semester (Exit)		**Branch:** ME	
Course Code:	**U24ME213X**	**Credits:**	**03**
Hours/Week (L-T-P-E):	**2-0-2-4**	**CIE :**	**40 %**
Total Number of Teaching Hours:	**32 Hrs**	**ESE :**	**60 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: conventions, limits, fits & tolerances used in machine drawing.
LO2: screw threads, bolts, nuts and keys
LO3: cotter joint, revolving centre and types of couplings.
LO4: riveted joints, bearings and screw jack

THEORY COMPONENT

UNIT-I	**4 Hrs**

Introduction: Classification of machine drawings, Conventional representation- Materials, Springs, Welded joints, Gears, Machine components and Surface roughness; Limits, Fits and Tolerances- Introduction, representation of fits, hole and shaft basis systems

UNIT-II	**4 Hrs**

Machine Elements: Screw fastening - Screw thread nomenclature, Types of thread profiles; Bolted joints- Hexagonal headed bolt with nut and washer, studded joint; Nuts- Lock nut, castle nut, wile"s lock nut; Foundation bolts- eye foundation bolt; Keys- Representation of saddle key, sunk keys.

UNIT-III	**4 Hrs**

Cotter joints- Cotter joints with sleeve, knuckle joint; **Couplings**- Flexible couplings types of flanged couplings; **Non-aligned couplings**-Universal coupling, Oldham's coupling; Revolving Center.

UNIT-IV	**4 Hrs**

Riveted joint-Types of riveted joints and rivet heads; **Bearings**- Solid journal bearing, bushed journal bearing, Plummer block, collar thrust bearing, foot step bearing, Anti-friction bearings; Screw Jack.

LABORATORY COMPONENT

List of Experiments

1. Draw the Conventional representation of Welded Joints and Materials; introduction to AUTOCAD software-GUI, Settings, Standard toolbar, toolbars - DRAW, MODIFY, DIMENSION and PROPERTIES, design centre and tool palettes
2. Draw the diagram illustrating basic size deviations and tolerances.
3. Draw the different types of Screw thread profiles
4. Draw a hexagonal headed bolt with a nut and a washer in position, Eye foundation bolt.
5. Draw the Assembly of KNUCKLE JOINT
6. Draw the part drawing of Revolving Center
7. Draw the Assembly of BUSHED BEARING.
8. Draw the Assembly of SCREW JACK.

Text book(s):

1. Siddheshwar, Kannaiah and Sastry, *Machine Drawing*, 48th reprint ed., New Delhi: McGraw-Hill Education Pvt. Ltd., 2014.

Reference Book(s):

1. Narayana, Venkat Reddy and Kannaiah, *Machine Drawing*, 3rd ed., New Age International, 2009.
2. Bhatt N. D. and Panchal V. M., *Machine Drawing*, 46th ed., Charotar Publishing House, 2011.

Web and Video link(s):
https://onlinecourses.swayam2.ac.in/aic22_ts41/preview Engineering drawing and computer graphics in Telugu, SWAYAM-NPTEL lecture by Prof. Rajaram Lakkaraju, IIT Kharagpur

Laboratory Manual (for laboratory component): *Modelling Laboratory Manual,* Department of Mechanical Engineering, KITSW.

Course Learning Outcomes (COs): Course Learning Outcomes (COs):

After completion of this course, the students should be able to,

CO1: apply the conventions, limits, fits & tolerances in machine drawing
CO2: draw screw threads, bolts, nuts and keys
CO3: draw sectional views of cotter joint and couplings
CO4: draw sectional views of riveted joints and bearings

(based on skills acquired from laboratory component)

CO5: apply the conventions, limits, fits & tolerances in machine drawing
CO6: draw screw thread profiles and bolted joints
CO7: assemble knuckle joint and draw part drawing of revolving center
CO8: draw the assembly of bushed bearing and screw jack

Course Articulation Matrix (CAM):		**U24ME213X MACHINE DRAWING AND MODELLING**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24ME213X.1**	2	1	-	-	-	1	1	1	1	1	1	1	1
CO2	**U24ME213X.2**	2	1	-	-	-	1	1	1	1	1	1	1	1
CO3	**U24ME213X.3**	2	1	-	-	-	1	1	1	1	1	1	2	1
CO4	**U24ME213X.4**	2	1	-	-	-	1	1	1	1	1	1	2	-
CO5	**U24ME213X.5**	2	1	-	-	1	1	1	1	1	1	1	1	1
CO6	**U24ME213X.6**	2	1	-	-	1	1	1	1	1	1	1	1	1
CO7	**U24ME213X.7**	2	1	-	-	1	1	1	1	1	1	1	2	1
CO8	**U24ME213X.8**	2	1	-	-	1	1	1	1	1	1	1	2	1
	U24ME213X	**2**	**1**	**-**	**-**	**1**	1	**1**	**1**	**1**	1	**1**	**1.5**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

BASIC MECHANICAL ENGINEERING			
Class: B.Tech. II-Semester (Exit)		**Branch:** ME	
Course Code:	**U24ME214X**	**Credits:**	**03**
Hours/Week (L-T-P-E):	**2-0-2-4**	**CIE :**	**40 %**
Total Number of Teaching Hours:	**32 Hrs**	**ESE :**	**60 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: the basic elements of power transmission and bearings.
LO2: the basic manufacturing processes and sand casting
LO3: principles of welding
LO4: fundamentals of machining

THEORY COMPONENT

UNIT-I	4 Hrs

Power Transmission: Classification; Flat belt drives - open and cross belts; Introduction to Gears. **Bearings**: Types - Sliding and rolling contact; Lubricants - Objectives, types, properties and applications.

UNIT-II	4 Hrs

Manufacturing Processes: Classification and their applications.
Sand Casting: Terminology; Mould cross section; Moulding sand-types and properties; Patterns-types, materials and allowances.

UNIT-III	4 Hrs

Welding: Principle, equipment and applications of gas welding, types of flames; Principle, equipment and applications of arc welding; brazing and soldering

UNIT-IV	4 Hrs

Machining: Classification; Lathe machine-line diagram and functions of various parts, lathe operations; milling machine-construction and operations, drilling machine-construction and operations

LABORATORY COMPONENT

List of Experiments

1. Prepare a Square fit using Mild Steel Plates
2. Prepare a Half round fit using Mild Steel Plates
3. Prepare a Sand Mould using bracket pattern
4. Prepare a Sand Mould using dumbbell pattern
5. Prepare a Lap joint on Mild Steel Plates using Arc Welding
6. Prepare a Single V – Butt Joint on Mild Steel Plates using Arc Welding
7. Perform a Step turning operation on mild steel bar
8. Perform a Taper turning operation on mild steel bar

Text book(s):

1. Basant Agrawal and Agrawal C.M., *Basic Mechanical Engineering*, New Delhi: Wiley India Pvt. Ltd.
2. Mathur, Mehta and Tiwari, *Elements of Mechanical Engineering*, New Delhi: Jain Brothers.
3. Hazra Chowdary. S. K and Bose, *Basic Mechanical Engineering*, Media Promoters and Publishers Pvt. Ltd, India.

Reference Book(s):

1. Nag P. K., *Engineering Thermodynamics*, New Delhi: Tata McGraw Hill.
2. Hazra Chowdary S. K and Bose, *Workshop Technology*, Vol. I & II, Media Promoters and publishers Pvt. Ltd., India,

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc24_me104/preview NPTEL Video Lecture on Basics of Mechanical Engineering – 1 Prof. Janakranjan Ramkumar, Prof. Amandeep Singh Oberoi, IIT Kanpur

Laboratory Manual (for laboratory component): *Workshop Laboratory Manual,* Department of Mechanical Engineering, KITSW.

Course Learning Outcomes (COs): Course Learning Outcomes (COs):

After completion of this course, the students should be able to,

CO1: differentiate between belt drive and gear drive; Sliding and rolling contact bearings
CO2: classify manufacturing processes and illustrate sand casting process
CO3: compare and contrast arc and gas welding; brazing and soldering
CO4: draw the constructional diagram of lathe, milling, drilling and list their operations

(based on skills acquired from laboratory component)

CO5: Assemble parts of the fitting joints
CO6: design and prepare a mould cavity using single and two piece pattern
CO7: produce weld joints using arc welding and gas welding
CO8: perform various operations on lathe

Course Articulation Matrix (CAM):		**U24ME214X BASIC MECHANICAL ENGINEERING**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24ME214X.1**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO2	**U24ME214X.2**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO3	**U24ME214X.3**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO4	**U24ME214X.4**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO5	**U24ME214X.5**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO6	**U24ME214X.6**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO7	**U24ME214X.7**	1	1	-	-	-	-	1	1	1	1	1	1	1
CO8	**U24ME214X.8**	1	1	-	-	-	-	1	1	1	1	1	1	1
U24ME214X		**1**	**1**		-	-	-	1	1	**1**	**1**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														