B.E. Mechanical Engineering

REGULATION 2023

CURRICULUM AND SYLLABI

I to IV SEMESTER

ENGINEERING COLLEGE

(Autonomous)

EXCEL ENGINEERING COLLEGE
(Autonomous)
**Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA and NAAC with "A" and Recognized by UGC(2f&12B)
KOMARAPALAYAM - 637303**

**B.E. MECHANICAL ENGINEERING
REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM AND SYLLABI**

I SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA102	Matrices and Calculus	BS	3	2	0	4	40	60	100
23EE103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
23ME102	Fundamentals of Mechanical Engineering	PC	3	0	0	3	40	60	100
23LET07	Heritage of Tamils (தமிழர் மரபு)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23ENEXX	Language Elective – I	HSS	2	0	2	3	50	50	100
23CH102	Chemistry for Materials Science	BS	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Mandatory Course- I									
23MC001	Induction Programme	MC	2 Weeks			0	100	0	100
TOTAL			16	2	8	21	370	330	700

Language Electives – I									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23ENE01	Communicative English	HSS	2	0	2	3	50	50	100
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

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II SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA202	Mathematical Foundation for Engineering	BS	3	2	0	4	40	60	100
23ME201	Engineering Mechanics	ES	3	2	0	4	40	60	100
23LET08	Tamils & Technology (தமிழரும் தொழில்நுட்பமும்)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23ENEXX	Language Elective – II	HSS	2	0	2	3	50	50	100
23PH202	Material Physics	BS	3	0	2	4	50	50	100
23CS203	Problem Solving using Python Programming	ES	3	0	2	4	50	50	100
Practical Course(s)									
23ME202	Mechanical Engineering Practices Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory course -II	MC	2	0	0	0	100	-	100
Total			**17**	**4**	**8**	**21**	**490**	**310**	**800**
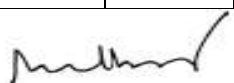
Language Electives – II									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23LEH03	Hindi	HSS	2	0	2	3	50	50	100
23LEF04	French	HSS	2	0	2	3	50	50	100
23LEG05	German	HSS	2	0	2	3	50	50	100
23LEJ06	Japanese	HSS	2	0	2	3	50	50	100

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	III SEMESTER								
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23ME301	Engineering Thermodynamics	ES	3	2	0	4	40	60	100
23ME302	Engineering Materials and Metallurgy	PC	3	0	0	3	40	60	100
23ME303	Fluid Mechanics and Machinery	PC	3	0	0	3	40	60	100
23UH001	Universal Human Values	HSS	3	0	0	3	100	0	100
Theory with Practical Course(s)									
23MA301	Transforms and Boundary Value Problems	BS	3	2	0	4	50	50	100
23ME304	Manufacturing Technology – I	PC	3	0	2	4	50	50	100
Practical Course(s)									
23ME305	Computer Aided Machine Drawing Laboratory	PC	0	0	2	1	60	40	100
23ME306	Fluid Mechanics and strength of materials laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course - III	MC	2	0	0	0	100	-	100
TOTAL			20	4	6	23	540	360	900

	IV SEMESTER								
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23ME401	Strength of Materials	ES	3	0	0	3	40	60	100
23ME402	Thermal Engineering	PC	3	0	0	3	40	60	100
23ME403	Manufacturing Technology – II	PC	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23MA401	Numerical Analysis and Statistics	BS	3	2	0	4	50	50	100
23ME404	Engineering Metrology	PC	3	0	2	4	50	50	100
23EE409	Electrical Drives and Microprocessor	ES	3	0	2	4	50	50	100
Practical Course(s)									
23ME405	Thermal Engineering Laboratory	PC	0	0	2	1	60	40	100

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23ME406	Manufacturing Technology Laboratory – II	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course -IV	MC	2	0	0	0	100	-	100
Total			**20**	**2**	**8**	**23**	**490**	**410**	**900**

V SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23ME501	Design of Machine Elements	PC	3	0	0	3	40	60	100
23ME502	Heat and Mass Transfer	PC	3	0	0	3	40	60	100
23ME503	Computer Aided Manufacturing	PC	3	0	0	3	40	60	100
23MEEXX	Professional Elective – I	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective – I	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23ME504	Dynamics of Machinery	PC	3	0	2	4	50	50	100
Practical Course(s)									
23ME505	Heat Transfer Laboratory	PC	0	0	2	1	60	40	100
23ME506	Computer Aided Manufacturing Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course -V	MC	2	0	0	0	100	-	100
TOTAL			**20**	**0**	**6**	**21**	**470**	**430**	**900**

VI SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23ME601	Design of Transmission System	PC	3	1	0	4	40	60	100
23ME602	Finite Element Analysis	PC	3	0	0	3	40	60	100
23MEEXX	Professional Elective - II	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective – II	OE	3	0	0	3	40	60	100

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Theory with Practical Course(s)

| 23ME603 | Mechatronics Engineering | PC | 3 | 0 | 2 | 4 | 50 | 50 | 100 |

Practical Course(s)

23ME604	Modeling Laboratory	PC	0	0	4	2	60	40	100
23ME605	Design Thinking & Mini Project	EEC	1	0	2	2	60	40	100
23ME606	Internship	EEC	Two Weeks			1	100	0	100
Total			**16**	**1**	**8**	**22**	**430**	**370**	**800**

VII SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23ME701	Entrepreneurship and Professional Ethics	PC	3	0	0	3	40	60	100
23ME702	Total Quality Management	HSS	3	0	0	3	40	60	100
23MEEXX	Professional Elective - III	PE	3	0	0	3	40	60	100
23MEEXX	Professional Elective - IV	PE	3	0	0	3	40	60	100
23MEEXX	Professional Elective - IV	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective – III	OE	3	0	0	3	40	60	100
Practical Course(s)									
23ME704	Simulation and Analysis Laboratory	PC	0	0	2	1	60	40	100
23ME705	Design Project	EEC	0	0	2	1	60	40	100
TOTAL			**18**	**0**	**4**	**20**	**320**	**380**	**700**

VIII SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MEEXX	Professional Elective - V	PE	3	0	0	3	40	60	100
23MEEXX	Professional Elective – VI	PE	3	0	0	3	40	60	100
23ME801	Major Project	EEC	0	0	16	8	50	50	100
Total			**6**	**0**	**16**	**14**	**130**	**170**	**300**

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MANDATORY COURSES (MC)									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MEEXX	Induction Programme	MC	2 Weeks			0	100	-	100
23MEEXX	Environmental Sciences	MC	2	0	0	0	100	-	100
23MEEXX	Interpersonal Skills	MC	2	0	0	0	100	-	100
23MEEXX	Indian Constitution	MC	2	0	0	0	100	-	100
23MEEXX	Yoga and Values for Holistic Development	MC	2	0	0	0	100	-	100

PROFESSIONAL ELECTIVES (PE)									
Stream – I Design Engineering									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MEE01	Design Thinking	PE	3	0	0	3	40	60	100
23MEE02	Product Design	PE	3	0	0	3	40	60	100
23MEE03	Tool and Die Design	PE	3	0	0	3	40	60	100
23MEE04	Design of Hydraulic and Pneumatic Systems	PE	3	0	0	3	40	60	100
23MEE05	Design for Manufacturing and Assembly	PE	3	0	0	3	40	60	100
23MEE06	Optimization Techniques in Engineering Design	PE	3	0	0	3	40	60	100
23MEE07	Computational Fluid Dynamics	PE	3	0	0	3	40	60	100
23MEE08	Engineering Tribology	PE	3	0	0	3	40	60	100
23MEE09	Mechanical Vibrations	PE	3	0	0	3	40	60	100
23MEE10	Design of pressure vessels	PE	3	0	0	3	40	60	100
23MEE61	Automobile Engineering	PE	3	0	0	3	40	60	100
23MEE62	Automotive transmission systems	PE	3	0	0	3	40	60	100
23MEE63	Vehicle body engineering	PE	3	0	0	3	40	60	100
Stream – II Thermal Engineering									
23MEE21	Non-Conventional Energy Sources	PE	3	0	0	3	40	60	100
23MEE22	Power Plant Engineering	PE	3	0	0	3	40	60	100

23MEE23	Refrigeration and Air Conditioning	PE	3	0	0	3	40	60	100
23MEE24	Turbo Machines	PE	3	0	0	3	40	60	100
23MEE25	Gas Dynamics and Jet Propulsion	PE	3	0	0	3	40	60	100
23MEE26	Internal Combustion Engines	PE	3	0	0	3	40	60	100
23MEE27	Cryogenic Engineering	PE	3	0	0	3	40	60	100
23MEE28	Design of Heat exchangers	PE	3	0	0	3	40	60	100
23MEE29	Refrigerants	PE	3	0	0	3	40	60	100
23MEE30	Gas turbines	PE	3	0	0	3	40	60	100
23MEE64	Alternate fuels for automobiles	PE	3	0	0	3	40	60	100
23MEE65	Automotive emission and control	PE	3	0	0	3	40	60	100
23MEE68	Electric and hybrid vehicles	PE	3	0	0	3	40	60	100
Stream – III Manufacturing Engineering									
23MEE41	Additive Manufacturing	PE	3	0	0	3	40	60	100
23MEE42	Industrial Automation	PE	3	0	0	3	40	60	100
23MEE43	Modern Manufacturing Processes	PE	3	0	0	3	40	60	100
23MEE44	Industrial Robotics	PE	3	0	0	3	40	60	100
23MEE45	Advanced casting techniques	PE	3	0	0	3	40	60	100
23MEE46	Advanced welding techniques	PE	3	0	0	3	40	60	100
23MEE47	Process Planning and cost estimation	PE	3	0	0	3	40	60	100
23MEE48	Operations Research	PE	3	0	0	3	40	60	100
23MEE49	Manufacturing of composite materials	PE	3	0	0	3	40	60	100
23MEE50	CNC Machine tools	PE	3	0	0	3	40	60	100
23MEE51	Supply chain management	PE	3	0	0	3	40	60	100
23MEE66	Two and three wheelers	PE	3	0	0	3	40	60	100
23MEE67	Off road vehicles	PE	3	0	0	3	40	60	100
23MEE69	Vehicle maintenance	PE	3	0	0	3	40	60	100
23MEE70	Smart mobility	PE	3	0	0	3	40	60	100

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	OPEN ELECTIVE COURSES (For Other Branches)								
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MEO01	Integrated Product Development	OE	3	0	0	3	40	60	100
23MEO02	Manufacturing processes	OE	3	0	0	3	40	60	100
23MEO03	Automotive Technology	OE	3	0	0	3	40	60	100
23MEO04	Alternate energy sources	OE	3	0	0	3	40	60	100
23MEO05	Robotics	OE	3	0	0	3	40	60	100
23MEO06	Principles of management	OE	3	0	0	3	40	60	100
23MEO07	Industrial Automation	OE	3	0	0	3	40	60	100
23MEO08	Machine Learning	OE	3	0	0	3	40	60	100
23MEO09	Autotronics	OE	3	0	0	3	40	60	100
23MEO10	Thermal Management systems	OE	3	0	0	3	40	60	100

	ONE CREDIT COURSES								
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MEA01	Lean Manufacturing	EEC	1	0	0	1	100	0	100
23MEA02	Internet of things	EEC	1	0	0	1	100	0	100
23MEA03	Plastics – Processing, Tooling, Assembly and Testing	EEC	1	0	0	1	100	0	100
23MEA04	Automotive Electronics	EEC	1	0	0	1	100	0	100
23MEA05	CNC Programming	EEC	1	0	0	1	100	0	100
23MEA06	PLC Programming	EEC	1	0	0	1	100	0	100
23MEA07	Vehicle testing and certification	EEC	1	0	0	1	100	0	100
23MEA08	Welding technology	EEC	1	0	0	1	100	0	100
23MEA09	Casting engineering	EEC	1	0	0	1	100	0	100
23MEA10	Fuel Cell technology	EEC	1	0	0	1	100	0	100

CREDIT SUMMARY

S. No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDITS (AICTE)	CREDITS in %
		I	II	III	IV	V	VI	VII	VIII		
1.	HSS	4	4	3				3		14 (10-14)	8.48%
2.	BS	8	8	4	4					24 (22-28)	14.55%
3.	ES	6	9	4	7					26 (24)	16.36%
4.	PC	3		12	12	15	13	4		59 (48)	36.97%
5.	PE					3	3	9	6	21 (18)	10.91%
6.	OE					3	3	3		9	5.45%
7.	EEC						3	1	8	12 (12-16)	7.27%
8.	MC	0	0	0	0	0	0	0	0	0	0.00%
	Total	21	21	23	23	21	22	20	14	165	100%

HSS - Humanities and Social Sciences

BS   - Basic Sciences

ES   - Engineering Sciences

PC   - Professional Core

PE   - Professional Electives

OE   - Open Electives

EEC - Employability Enhancement Courses

MC   - Mandatory Courses (Non-Credit Courses)

CA   - Continuous Assessment

FE   - Final Examination

23MA102	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the concept of orthogonal transformation to convert the square matrix into diagonal form.
2. Acquaint the student with mathematical tools needed in evaluating derivatives and differentiation of one variable.
3. Familiarize the functions of two variables, Taylor series and Jacobian techniques
4. Impart knowledge of double integral techniques in evaluating volume of the solid.
5. Learn the Green's theorem Stoke's theorem and the Divergence theorem to compute integrals

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Apply the concept of orthogonal reduction for diagonalization of the given matrix	Apply
CO 2	Execute the rules of differentiation to differentiate the functions.	Apply
CO 3	Demonstrate the maxima and minima for a given function with two variables	Apply
CO 4	Apply integration to compute area and volume using multiple integrals	Apply
CO 5	Interpret the Green's theorem, Stokes' theorem and Divergence theorem to evaluate integrals.	Apply

Course Contents

Module – I   MATRICES   9+3

Eigen values and Eigenvectors of a real matrix – Characteristic Equation- Properties - Cayley Hamilton Theorem - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic Forms.

Module – II   DIFFERENTIAL CALCULUS   9+3

Functions of single Variable -Limits and Continuity - Derivatives - Differentiation rules(sum, product, quotient, chain rule) – Implicit differentiation-Logarithmic differentiation-Maxima and Minima of function of one variable –Taylors series.

Module – III   FUNCTIONS OF TWO VARIABLES   9+3

Limits and Continuity –Partial differentiation-Homogeneous functions and Euler's theorem– Jacobians –Partial differentiation of implicit functions–Taylor's series– Maxima and minima – Lagrange's method of multipliers.

Module – IV   MULTIPLE INTEGRALS

Double integrals – Change of order of Integrations- Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

Module – V   VECTOR CALCULUS

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification and application in evaluating line, surface and volume integrals (cube, rectangular parallelepiped)

Total : 60 Periods

Text Books

1. B.K.Pal and K.Das , "Engineering Mathematics", Volume-1, 10^E Edition, U.N.Dhur and Sons private limited, 2020
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44^t Edition, 2019

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 1st Edition, 2018
2. N.P.Ball, Manish Goyal, "A text book of Engineering Mathematics Semester II", Laxmi Publications, 6th Edition 2015.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References

1. NPTEL-https://nptel.ac.in/courses/111105035
2. NPTEL-https://nptel.ac.in/courses/111104144
3. NPTEL-https://nptel.ac.in/courses/111105122

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2										1	
CO 2	3	3	2										1	
CO 3	3	1	1										1	
CO 4	3	2	1										1	
CO 5	3	2	2										1	
	3-High			2-Medium			1-Low							

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

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Formative Assessment

Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations (IAE)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	60
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

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23EE409	Electrical Drives and Control	L	T	P	C
		3	0	0	3
Nature of course	Engineering Sciences				
Pre requisites	Basics of Electrical and Electronics Engineering				

Course Objectives

The course is intended to

1. Learn steady state operation and transient dynamics of a motor load system
2. Study the different methods of starting and characteristics of drive motors
3. Learn the conventional speed control concepts of drive motors
4. Know solid state control of drive motors
5. Learn the industrial applications in drive motor control.
6. Relate the concept of AC and DC drives with its applications.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Summarize the basic drive system and inter prelit for different types of loads.	Understand
CO2	Show the motor situation during starting and braking.	Understand
CO3	Develop control circuitry and devices for control of motor.	Apply
CO4	Construct the circuit for control purpose along with its different configuration.	Apply
CO5	Develop the Digital control system for drive applications.	Apply

Course Contents

Module –I	Introduction	9

Basic elements-types of electric drives-factors influencing electric drives-heating and cooling curves loading conditions and classes of duty-Selection of power rating for drive motors with regard to thermal overloading and load variation factors

Module –II	Drive motor characteristics	9

Mechanical characteristics- speed- torque characteristics of various types of load and drive motors - braking of electrical motors-dc motors: shunt, series, compound motors-single phase and three phase induction motors

Module–III	Starting methods	9

Types of d.c motor starters-typical control circuits for shunt and series motors-three phase squirrel and slip ring Induction motors

Module–IV	Conventional and solid-state speed control of D.C Drives	9

Speed control of DC series and shunt motors-Armature and field control, ward-Leonard control system using controlled rectifiers and DC choppers –applications

Module–V	Conventional and solid-state speed control of AC drives	9

Speed control of three phase induction motor-Voltage control, voltage/frequency control, slip power recovery scheme-using inverters and AC voltage regulators-applications

Total: 45 Periods

Text Books

1. J.Gnanavadivel,"ElectricalDrivesandControl",AnuradhaPublications,2004.
2. Vedam Subramaniam "Electric drives (concepts and applications)", Tata McGraw-Hill.2001
3. G.K.Dubey,"PowerSemiconductorControlledDrives",PrenticeHallInternational,1989.

Reference Books

1. WernerLeonhard,"ControlofElectricalDrives",Springer(India)Pvt.Ltd.,2006.
2. Bimal K, Bose, "Modern Power Electronics and AC Drives", Pearson Education,2015.
3. IonBoldea and S. A.Nasar, "Electric Drives", CRC Press LLC, NewYork, 3rd edition, 2016.

Web References

1. http://electrical-engineering-portal.com/download-center/books-and-guides/siemens-basics-ofenergy/basics-of-dc-drives.
2. https://www.joliettech.com/products/dc-variable-speed-drives/dc-drive-fundamentals/

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2			3							2		3
CO 2	3	2			3							2		3
CO 3	3	2			3							2		3
CO 4	3	2			3							2		3
CO 5	3	2			3							2		3
	3-High				2-Medium				1- Low					

Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class/Assignment	5	15
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations			Final Examination (60)
	IAE I(5)	IAE II(10)	IAE III(10)	
Remember	10	10	10	20
Understand	20	20	10	40
Apply	20	20	30	40
Analyze				
Evaluate				
Create				

23ME102	**Fundamentals of Mechanical Engineering**	L	T	P	C
		3	0	0	3

Nature of Course	Engineering Sciences
Pre requisites	Nil

Course Objectives

The course is intended to

1. Impart knowledge of mechanical engineering fundamentals of application.
2. Gain knowledge of mechanical process and their applications.
3. Learn the principles of power plant engineering with suitable properties.
4. Develop a clear understanding about internal combustion engines.
5. Explore the knowledge on thermodynamics for refrigeration cycles

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Summarize the metal casting process.	Understand
CO2	The joining process of metal to arc, electrode and gas welding process	Understand
CO3	Compare the properties of water tube and tube boilers	Understand
CO4	Infer and compare the performance of I.C engines	Understand
CO5	Contrast the refrigeration and air conditioning systems	Understand

Course Contents

Module I   Metal Casting Process   9
Manufacturing Process: Casting, pattern, pattern materials, types, allowances, molding tools, preparation of green sand mould, and manufacturing of cast iron, Cupola furnace, and operation, casting defects, causes and remedies.

Module II   Metal Joining Process   9
Arc welding**,** Arc welding equipment, electrode, welding process, defects in welding Gas welding, equipment

Module III   Power Plant Engineering   9
Thermal systems: Introduction, Classification of Power Plants, Working principle of steam, fire tube and water tube boilers

Module IV   Internal Combustion Engines   9
Internal combustion engines as automobile power plant, working principle of Petrol and Diesel Engines, Four stroke and two stroke cycles, Comparison of four stroke and two stroke engines

Module V   Refrigeration and Air Conditioning Systems   9
Terminology of Refrigeration and Air Conditioning, Principle of vapor compression refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner

Total: 45 Periods

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Text Books
Passed in Board of studies Meeting   *Approved in Academic Council Meeting*

1. Shanmugam G. , Palanichamy M.S., "Basic Civil and Mechanical Engineering", McGraw Hill Education, 2018.

2. Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", Media Promotors Pvt Ltd., Mumbai, 2010.

3.Rao P.N., "Manufacturing Technology", Tata McGraw-Hill Publishing Limited, II Edition, 2018

Reference Books

1. Magendran Parashar B.S. and Mittal R.K."Elements of Manufacturing Processes", Prentice Hall of India, 2003.

2. Gowri S., Hariharan P. and Suresh Babu A., "Manufacturing Technology 1", Pearson Education , 2008.

3. Sharma, P.C., "A text book of Production Technology", Chand, S and Company, IV Edition, 2003.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2										1		
CO2	3	3	2										1		
CO3	3	3	2										1		
CO4	3	3	2										1		
CO5	3	3	2										1		
	3	\multicolumn{3}{c}{High}		2	\multicolumn{3}{c}{Medium}			1	Low			

Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Understand	Direct Measures : Quiz / Presentation/Tutorial	5	
Understand	Indirect measures : Assignment/Video presentation	5	15
	Attendance	5	

Summative Assessment

Bloom's Category	Exams			Final Examination
	IAE 1 (5)	IAE 2 (5)	IAE 3 (10)	(60)
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

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Passed in Board of studies Meeting   *Approved in Academic Council Meeting*

23LET07   தமிழர் மரபு   L T P C
                                                           1 0 0 1

அலகு I   மொழி மற்றும் இலக்கியம்:   3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II   மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை –   3
**   சிற்பக் கலை:**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III   நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:   3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV   தமிழர்களின் திணைக் கோட்பாடுகள்:   3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V   இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்
**   தமிழர்களின் பங்களிப்பு:**   3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

                                                TOTAL : 15 PERIODS

TEXT BOOKS
1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகா ன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம், (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (In print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LET07   **HERITAGE OF TAMILS**   L T P C
                                                                            1 0 0 1

UNIT I   LANGUAGE AND LITERATURE   3

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II   HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE   3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III   FOLK AND MARTIAL ARTS   3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV   THINAI CONCEPT OF TAMILS   3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V   CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN
CULTURE   3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

TEXT BOOKS   **TOTAL : 15 PERIODS**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23ENE01	COMMUNICATIVE ENGLISH	L	T	P	C
	Common to all B.E./B.Tech Programmes	2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to
1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations.
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Use effectively the lexical, grammatical and semantic knowledge	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I   BASIC GRAMMAR AND USAGE   9
Grammar: Parts of Speech -- Verb (Primary & Modal Auxiliary) -- Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening -- Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself – Role play **Reading:** Types of Reading – Intensive reading – Extensive Reading – Reading Comprehension **Writing:** Permission letter (Industrial Visit) – Informal letter – Dialogue writing

MODULE II   APPLICATIONS OF LANGUAGE SKILLS   9.
Grammar: Tenses (Present, Past and Future) – Different Forms of a word – Types of Questions **Listening:** Listening strategies – Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews – **Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries – Accepting Invitation – Declining Invitation.

MODULE III   CONVERSATIONAL SKILLS   9
Grammar: If conditionals – Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes – Listening Lectures **Speaking:** Technical Presentation – Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation – Complaint Letter – Process Description

MODULE IV   GRAMMATICAL ACCURACY COMPETENCE   9
Grammar: Subject verb agreement – Discourse markers - One word substitution **Listening:** Listening and gap filling – Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions – Hints Developing – Report Writing (Fire and Accident Report)

Passed in Board of Studies Meeting on 17.03.23   Passed in Academic Council Meeting on 27.04.23

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MODULE V   TECHNICAL WRITING SKILLS
Grammar: Homophones and Homonyms - Abbreviation and Acronyms Listening: Listening announcements – Listening and Summing up Speaking: Impromptu speech – Presentation at a business meeting Reading: Reading and summarizing articles Writing: Paragraph Writing – Checklist – Story writing.

Total: 45 Periods

Laboratory Components

S.No.	List of Exercises	CO Mapping	RBT
1	Self Introduction	1	Understand
2	Movie Review	2	Apply
3	Group Discussion	3	Apply
4	Asking and Giving Directions	4	Apply
5	Impromptu Speech	5	Apply
6	Listening to short monologues	1	Understand
7	Listening to Announcement	2	Understand
8	Listening Telephone calls	3	Understand
9	Listening and Gap Filling	4	Apply
10	Listening and Match the answers	4	Apply

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication",Tata McGraw Hill Publishing company Limited,New Delhi, 2nd Edition, 2018.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books:

1 Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press,USA,13thEdition,2018.
2. Norman Whitby, Business Benchmark – "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1st Edition, 2006.
3. Dhanavel S. P., "English and Soft Skills", 1stEdition, Orient Black Swan Private Limited, Hyderabad, 1st Edition, 2010.

Web References:

1. https://www.englishclub.com/grammar/
2. https://learnenglish.britishcouncil.org
3 https://www.indiabix.com/verbal-ability/questions-and-answers/
4. https://www.ello.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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Passed in Board of Studies Meeting on 17.03.23   Passed in Academic Council Meeting on 27.04.23

Mapping of Course Outcomes (CO) with Programming Outcomes (PO) Programme Specific Outcomes (PSO)

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

Summative assessment

Bloom's Level	Continuous Assessment					Final Examination (Theory) [50 marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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23CH102	CHEMISTRY FOR MATERIALS SCIENCE (Common to AERO, AGRI, CIVIL, MECH, PCT and SF)	L	T	P	C
		3	0	2	4

Nature of Course	Basic Sciences
Pre requisites	Nil

Course Objectives

The course is intended to

1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
2. Provide knowledge about the basic principles, preparatory methods and applications of nanomaterials.
3. Understand the causes and control measures of corrosion.
4. Learn about the nature, types of the soil and suitable fertilizers for different types of soil.
5. Gain knowledge about fuels and calorific value of solid fuel, liquid fuel and gaseous fuel.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand.	Apply
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials	Understand
CO 3	Demonstrate the importance of protection of metals from corrosion.	Understand
CO 4	Identify the nature of the soil and to decide fertilizer for a particular soil depending on its nature	Understand
CO 5	Classify fuels based on their efficiency of combustion.	Apply

Course Contents

Module – I   WATER ANALYSIS AND WATER TREATMENT   9

Water analysis: Sources of water, hard water and soft water, Hardness of water, acidity, alkalinity, pH value. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD). Water treatment: Definition, Zeolite process, Conditioning methods: internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization). Desalination, Reverse-osmosis (RO).

Module – II   NANOCHEMISTRY   9

Basics: Distinction between molecules, nanomaterials and bulk materials. Size-dependent properties, Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis: Sol-Gel and laser ablation methods. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Module – III   CORROSION AND ITS CONTROL   9

Corrosion: Classification, Types: Chemical corrosion and Electrochemical corrosion. Corrosion control: Corrosion Inhibitors, cathodic protection (sacrificial anodic protection, impressed current cathodic protection), Protective coating, Paint and Electroplating.

Passed in Board of Studies Meeting on 17.03.2023   Passed in Academic Council Meeting on 27.04.2023

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Module – IV   SOIL CHEMISTRY& FERTILIZER   9

Types of soil: saline soil, acidic soil and alkaline soil, submerged soil, salt affected and calcareous soil. Characteristics and Reclamation, Effect of N, P, K, Secondary nutrients and micronutrients on plant growth and development. Importance of nitrogenous fertilizers. Green manuring- definition and examples.

Module – V   FUELS AND COMBUSTION   9

Solid fuel: Coaland its varieties, analysis of coal: proximate and ultimate with their significance. Manufacture of metallurgical coke (Otto-Hoffmann method).Liquid fuel: petroleum oil. Knocking: octane number. Diesel: cetane number. Gaseous fuels - Water gas and Liquefied Petroleum Gas. Combustion: Introduction, Calorific value- Gross and net calorific value; Dulong's formula and problems.

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water.	3	Apply
2	Determination of chloride content in water sample.	3	Apply
3	Conductometric titration of strong acid versus strong base.	3	Apply
4	Determination of strength of HCl by pH metry.	3	Apply
5	Estimation of copper in brass by EDTA method.	3	Apply
6	Determination of rate of corrosion by weight loss method	3	Apply
7	Estimation of strength of iron by potentiometric titration	3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	3	Apply

Total Periods: 30

Text Books

1. Dr. A. Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing Company, Chemistry, 2021.
2. N. Krishnamurthy, "Engineering Chemistry" PHI Learning, 4th Edition, 2020.
3. Dr.Sunita Rattan. Publisher, S.K. Katana& Sons. Edition. Reprint, 2020

Reference Books

1. S S. Dara. "A Text Book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018
2. B.S Murty, P. Shankar. Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science. 2018.
3. Murthy, V.N S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2017

Additional References

1. https://nptel.ac.in/downloads/122101001
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
3. https://nptel.ac.in/courses/102103044/3
4. https://www.youtube.com/watch?v=jFOeDef6bug

CHAIRMAN - BOARD OF STUDIES

Passed in Board of Studies Meeting on 17.03.2023   Passed in Academic Council Meeting on 27.04.2023

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2									1			
CO 2	3	2									1			
CO 3	3	1									1			
CO 4	3	2									1			
CO 5	3	2									1			
	3-High				2-Medium				1-Low					

Summative Assessment

Bloom's Level	Continuous Assessment				Practicals	Final Examination (Theory) [50]
	Theory				Rubric based CIA [20]	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]		
Remember	20	20	20		-	30
Understand	25	25	25		40	60
Apply	5	5	5		60	10
Analyze	-	-	-		-	
Evaluate	-	-	.		-	
Create	-	-	.		-	

CHAIRMAN - BOARD OF STUDIES

23ENE01	COMMUNICATIVE ENGLISH	L	T	P	C
	Common to all B.E./B.Tech Programmes	2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to
1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations.
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Use effectively the lexical, grammatical and semantic knowledge	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I   BASIC GRAMMAR AND USAGE   9
Grammar: Parts of Speech -- Verb (Primary & Modal Auxiliary) -- Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening -- Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself -- Role play **Reading:** Types of Reading -- Intensive reading -- Extensive Reading -- Reading Comprehension **Writing:** Permission letter (Industrial Visit) -- Informal letter -- Dialogue writing

MODULE II   APPLICATIONS OF LANGUAGE SKILLS   9.
Grammar: Tenses (Present, Past and Future) -- Different Forms of a word -- Types of Questions **Listening:** Listening strategies -- Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews **- Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries -- Accepting Invitation -- Declining Invitation.

MODULE III   CONVERSATIONAL SKILLS   9
Grammar: If conditionals -- Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes -- Listening Lectures **Speaking:** Technical Presentation -- Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation -- Complaint Letter -- Process Description

MODULE IV   GRAMMATICAL ACCURACY COMPETENCE   9
Grammar: Subject verb agreement -- Discourse markers - One word substitution **Listening:** Listening and gap filling -- Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions -- Hints Developing - Report Writing (Fire and Accident Report)

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23ME101	**Engineering Graphics** **(Common to Aeronautical, Agriculture, Civil, Mechanical, Safety and Fire Engineering & Food Technology)**	**L**	**T**	**P**	**C**
		1	**0**	**4**	**3**
Nature of Course	Engineering Sciences				
Prerequisites	Nil				

Course Objectives:

The course is intended to

1. Understand technical drawings in various fields of engineering
2. Imagine and visualize the geometric details of engineering objects.
3. Translate the geometric information of engineering objects into engineering drawings.
4. Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
5. Visualize and draw isometric and perspective views

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces.	Apply
CO 5	Organize and draw isometric view of simple solids.	Apply

Course Contents

Concepts and Conventions (Not for Examination) **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Module -I **Plane Curves and Free Hand Sketching** **(3+12)**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three- Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

Module –II **Projection of Lines and Plane Surface** **(3+12)**

Orthographic projection- principles-Principal Planes-First angle projection- Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes

(polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module –III   Projection of Solids   (3+12)
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Module- IV   Projection of Sectioned Solids and Development of Surface   (3+12)
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section, Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

Module -V   Isometric Projections   (3+12)
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

TOTAL: (15+60) Periods

TEXT BOOKS
1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011
2. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.

REFERENCE BOOKS
1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill
Publishing Company Limited, New Delhi, 2008.
3. Parthasarathy N S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Web References
1. http://nptel.ac.in/courses/112103019/Engineering drawing
2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

Publication of Bureau of Indian Standards
1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable only to Final Examinations of Engineering Graphics:
1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

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

Summative assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50 marks]**
	Theory				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40
Analyse						
Evaluate						
Create						

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Passed in Board of studies Meeting   *Approved in Academic Council Meeting*

23MC101	INDUCTION PROGRAMME	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Completion of Schooling at Higher Secondary Level				

Course Objectives

The course is intended to

1. To nurture the character and behavior as a student.
2. To have broad understanding of society andrelationships.
3. To impart interpersonal and softskills.
4. To inspire the students in the field ofengineering.
5. To provide exposure toindustries.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Perform curricular and co-curricular activities excellently.	Knowledge
CO 2	Do the skill based training with excellence.	Understand
CO 3	Work as team for the given task	Apply
CO 4	Gain character and behaviour	Knowledge
CO 5	Demonstrate the acquired skills effectively	Apply

Course Contents
PHYSICAL ACTIVITY

Yoga, Sports

CREATIVE ARTS (students can select any one of their choice)

Painting, sculpture, pottery, music, craft making and so on

UNIVERSAL HUMAN VALUES

Enhancing soft skills

LITERARY AND PROFICIENCY MODULES

Reading, Writing, Speaking- Debate, Role play etc., Communication and computer skills

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Passed in Board of Studies Meeting 17.03.23   Passed in Academic Council Meeting27.04.23

LECTURES BY EMINENT PEOPLE
      Guest lecture by subject experts

VISIT TO LOCAL CITIES
      Meditation centers / Industry

FAMILARIZATION TO DEPARTMENT / BRANCH INNOVATION
      Lectures by Departments Head and senior faculty members

                                                  Total Hours: 45

Mapping of COs with POs and PSOs

<table>
<tr><th colspan="16">Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">POs</th><th colspan="3">PSOs</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>1</td><td>2</td><td></td><td></td><td></td><td>3</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>3</td><td colspan="4">High</td><td>2</td><td colspan="5">Medium</td><td>1</td><td>Low</td><td></td><td></td></tr>
</table>

<table>
<tr><th rowspan="2">Bloom's Level</th><th colspan="5">Continuous Assessment (Non-Credit, Mandatory)</th></tr>
<tr><th>Test -I
[20]</th><th>Test -II
[20]</th><th>Test - III
[20]</th><th>Assignment/ Activity
[20]</th><th>Attendance
[20]</th></tr>
<tr><td>Remember</td><td>10</td><td>10</td><td>10</td><td></td><td></td></tr>
<tr><td>Understand</td><td>20</td><td>20</td><td>20</td><td>10</td><td></td></tr>
<tr><td>Apply</td><td>20</td><td>20</td><td>20</td><td>10</td><td></td></tr>
<tr><td>Analyse</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Evaluate</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Create</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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23MA202	MATHEMATICAL FOUNDATIONS FOR ENGINEERING	L	T	P	C
	(Common to all B.E. / B.Tech Programme)	3	1	0	4

Nature of Course	Basic Sciences
Pre requisites	Fundamentals of Basic Mathematics

Course Objectives

The course is intended to

1. Understand the curvature and calculate the radius of curvature, centre, evolutes, involutes.
2. Acquire the mathematical skills required to solve ordinary differential equations.
3. Familiarizethe concepts of Laplace transform and its inverse.
4. Gain knowledge of analytic approach to analyse the conformal mapping.
5. Obtainthe knowledge of evaluating contour integrals using residue theorem.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the circle of curvature, evolutes and involutes of the curves.	Apply
CO2	Demonstrate various techniques to solve ordinary differential equations.	Apply
CO3	Select Laplace transform to standard functions and solve initial value problems / differential equations .	Apply
CO4	Find an analytic function ,when its real or imaginary part is known	Apply
CO5	Classify the Singularities and its corresponding Residues for the given function	Apply

Course Contents:

Module – I	APPLICATION OF DIFFERENTIAL CALCULUS	12

Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes.

Module – II	ORDINARY DIFFERENTIAL EQUATION	12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – non-Homogenous equation - Euler and Legendre Equations.

Module – III	LAPLACE TRANSFORMS	12

Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem - Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.

Module – IV	ANALYTIC FUNCTIONS	12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping : w = a+z, az, 1/z – Bilinear transformation.

Module – V	COMPLEX INTEGRATION	12

Line integral - Cauchy's integral theorem –Cauchy's integral formula – Taylor's and Laurent's series — Singularities — Residues — Residue theorem — Application of residue theorem for evaluation of real integrals.

Total: 60 Periods

Text Books:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2019.
2. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Limited, 10th Edition, 2016.

Reference Books:

1. Bali.N.P and ManishGoyal N.P, "A text book of Engineering Mathematics", Laxmi Publications, 6th Edition, 2015.
2. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, 1st Edition, 2018.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc24_ma12/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
3. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3												
CO2	3	3	2												
CO3	3	2	2												
CO4	3	3	3												
CO5	3	3	3												
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Remember	Online Quiz	5	
Understand	Tutorial Class /Assignment	5	15
	Attendance	5	

| Bloom's Category | Summative Assessment | | | Final Examination (60) |
| | Internal Assessment Exam | | | |
	IAE I (5)	IAE II (10)	IAE III (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

23ME201	Engineering Mechanics (Common to Mechanical, Aeronautical, Agriculture, Civil, Safety and Fire Engineering)	L	T	P	C
		3	2	0	4

Nature of course	Engineering Science
Pre requisites	Fundamentals of Physics and Mathematics

Course Objectives

The course is intended to

1. Develop the capacity among students to predict the effect of forces and motion.
2. Make the students to understand the vector and scalar representation of forces and moment and the static equilibrium of particles.
3. Understand the effect of friction on equilibrium, laws of motion, motion kinematics and the interrelationship.
4. Make the students to understand the properties of surfaces and solids, prediction of behavior of particles and rigid bodies under the motion.
5. Make the students to familiar in laws of friction and applications of friction.

Course Outcomes

On successful completion of the course, students will be able to

COs. No.	Course Outcome	Bloom's Level
CO 1	Illustrate the Scalar and Vector representation of forces and moments.	Understanding
CO 2	Identify the Equilibrium of rigid bodies.	Apply
CO 3	Determination of properties of Surfaces and solids.	Apply
CO 4	Calculate dynamic effect of forces exerted in rigid bodies.	Apply
CO 5	Examine the laws of friction and its effects.	Apply

Course Contents

Module –I   Statics of Particles   **12**

Introduction - Units and Dimensions - Laws of Mechanics - Lami's theorem, Parallelogram and triangular Law of forces-Vectorial representation of forces - Vector operations of forces - additions, subtraction, dot product, cross product - Coplanar Forces - rectangular components - Equilibrium of a particle - Forces in space- Equilibrium of particle in a space - principle of transmissibility.

Module –II   Equilibrium of Rigid Bodies   **12**

Free body diagram - Types of supports -action and reaction forces - stable equilibrium – Moments and Couples - Moment of force about a point and an axis - Varigon's theorem - Equilibrium of Rigid bodies in two and three dimensions.

Module–III   Properties of Surfaces and Solids   **12**

Centroid and centre of gravity of masses - Centroid of lines and areas - Rectangular, circular, triangular areas by integration - T section, I section, - Angle section, Hollow section by using standard formula - Pappus Theorem - Parallel axis and perpendicular axis theorem -Principal moment of inertia.

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Module– IV   Dynamics of Particles   **12**

Displacement, Velocity and acceleration and their relationship - Relative motion - Curvilinear motion Newton's laws of motion - Work Energy Equation- Impulse and Momentum - Impact of elastic bodies.

Module –V   Friction and Elements of Rigid Body Dynamics   **12**

Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction wedge friction- Rolling resistance -Translation and Rotation of Rigid Bodies - General Plane motion of simple rigid bodies - cylinder and fly wheel dynamics.

Total : 60 Periods

Text Books
1. Rajasekaran, S. and Sankarasubramanian. G, 'Fundamentals of Engineering 17 Mechanics",Vikas Publishing House Pvl. Ltd., New Delhi, 2009.
2. Kumar, K.L., 'Engineering Mechanics", Tata McGraw-Hill Publishing Company, New Delhj, 3rd Revised Edition, 2008.

Reference Books
1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", Tata McGraw-Hill Publishing Company, New Delhi, 8th Edition 2004.
2. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", Pearson Education. 11th Edition. 2010.

Online Resources
1. http://nptel.ac.in/courses/122104015/
2. http://nptel.ac in/courses/112103109/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	2		1								2	3		
CO 2	3	2		1								2	3		
CO 3	3	2		1								2	3		
CO 4	3	2		1								2	3		
CO 5	3	2		1								2	3		
	3-High					**2- Medium**					**1-Low**				

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Understand	Quiz	5	
Apply	Tutorial Class / Assignment	5	15
	Attendance	5	

Passed in Board of Studies Meeting   CHAIRMAN - BOARD OF STUDIES   *Approved in Academic Council Meeting*

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	30
Understand	20	10	10	30
Apply	20	30	30	40
Analyze				
Evaluate				
Create				

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Passed in Board of Studies Meeting   *Approved in Academic Council Meeting*

23LET08	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
	TAMILS AND TECHNOLOGY (Common to all B.E. / B.Tech Programme)	1	0	0	1

Nature of Course	Humanities and Sciences
Pre requisites	Tamil

Course Objectives

The course is intended to

1. Introduce students to the great technology of ancient Tamil society.
2. Realize the contribution of various technologies for the development of governing area.
3. Highlighting the different manufacturing technology to make the coins, jewels, stones, art etc.
4. Know the role of agriculture, water management system and food processing.
5. Learn about the Scientific Tamil and Tamil computing of the past and how it has evolved over the generations.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Remember the life style and technology of the Sangam people.	Remember
CO 2	Get an updated knowledge of ancient designing and construction of House, Temple, hero stones etc.	Understand
CO 3	Learnt the speciality of manufacturing technology types and usages.	Understand
CO 4	Gain the knowledge on production of agricultural products based on the ancient technologies.	Understand
CO 5	Understand the evaluation of Tamil language through the digital system.	Understand

Course Contents (in Tamil)

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	2
	சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.	

அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	2
	சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு கட்டிடக் கலை - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.	

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	2

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சன்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	2

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுமிகள் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்.

அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	2

அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

Total : 10 Periods

Course Contents (in English)

Module – I	WEAVING AND CERAMIC TECHNOLOGY	2

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

Module – II	DESIGN AND CONSTRUCTION TECHNOLOGY	2

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Module – III	MANUFACTURING TECHNOLOGY	2

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads –Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

Module – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	2

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Module – V	SCIENTIFIC TAMIL & TAMIL COMPUTING	2

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total : 10 Periods

பார்வை நூல்கள் (TEXT-CUM-REFERENCE BOOKS)

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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23LEE02	ADVANCED COMMUNICATIVE ENGLISH	L	T	P	C
	(Common to all B.E. / B.Tech Programme)	2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Communicative English				

Course Objectives

The course is intended to

1. Hone professional communication skills, including email etiquette and formal presentation.
2. Develop advanced vocabulary and collocation for official communication.
3. Communicate effectively and actively in social interactions.
4. Improve writing skills such as project and report writing for various purposes.
5. Foster collaborative communication abilities through group discussion in diverse contexts.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Communicate professionally in various contexts.	Understand
CO 2	Make use of common English phrases and vocabulary.	Understand
CO 3	Integrate basic English communication skills at a personal and a professional level in day-to-day interaction.	Apply
CO 4	Implement listening, reading and writing skills in real - life situations	Apply
CO 5	Decipher collaborative communication skills through diversified contexts.	Understand

Course Contents

Module – I	TECHNICAL VOCABULARY AND USAGE	9

Grammar: Technical Vocabulary (Synonyms and antonyms) - Articles - Reported Speech - **Listening**: Listening to video lectures (TED / INK Talks) **Speaking**: Describing pictures, places – Speaking practice to improve pronunciation **Reading**: Critical reading from the given text **Writing**: Job Application with Resume - E mail writing.

Module – II	EFFECTIVE OFFICIAL COMMUNICATION	9

Grammar: Collocation – Question tags – Prepositions **Listening**: Listening to telephonic conversation **Speaking**: Role plays – Telephonic Etiquette and telephonic phrases **Reading**: Company profile - Advertisement (job / product) **Writing**: – Preparing Memo – Prepare Circular, Agenda and Minutes – Placing Order – Prepare Advertisement.

Module – III	TECHNICAL LANGUAGE SKILLS FOR CONVERSATION	9

Grammar: Degrees of Comparison – Conjunctions **Listening**: Sports commentaries – Animated short stories **Speaking**: Asking for and giving directions – Describing simple process **Reading**: Reading and understand technical vocabulary **Writing**: Letter to the Editor – Review of Favourite Movie / Book – Recommendations.

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Module – IV	LANGUAGE FOR BUSINESS CORRESPONDENCE	9
Grammar: Idioms and Phrases – Single line definitions Phrasal verbs **Listening:** Listening to informal communication **Speaking:** Narrating personal experience **Reading:** Speed reading – reading passage within the time limit **Writing:** Project writing – Report writing (Accident and Survey) – Preparing welcome address and vote of thanks.		
Module – V	VERBAL ABILITY FOR WRITING	9
Grammar: Verbal Analogy – Cause and effect expressions **Listening:** Listening to Iconic Speeches - debate and reviewing the performance **Speaking:** Group communication skills – Discussing social issues and current affairs **Reading:** Short story – critical reading **Writing:** Itinerary –Interpretation of charts (Flow chart and Pie chart) - Essay Writing and Paragraph.		

Total : 45 Periods

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Describing Picture / Place	1	Understand
2	Listening	1	Understand
3	Role Play	2	Understand
4	Prepare Circular, Agenda & Minutes	2	Understand
5	Asking and Giving Directions	3	Apply
6	Narrate a Favourite Movie / Book	3	Apply
7	Welcome Address	4	Apply
8	Vote of Thanks	4	Apply
9	Discussing Social Issues	5	Understand
10	Interpretation of Charts	5	Understand
		Total	15 Periods

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 8th Edition, 2020.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books

1. Dr. Krishnakumar TP, "Rudiments of Communication Skills", Buddha Publication,1st Edition, 2023.
2. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 13th Edition, 2018.
3. Dhanavel S. P., "English and Soft Skills", 1st Edition, Orient Black Swan Private Limited, Hyderabad, 2010.

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Web References:
1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	3	1		2	
CO 2									1	3	1		2	
CO 3									1	3	1		2	
CO 4									1	3	1		2	
CO 5									1	3	1		2	
	3-High			2-Medium			1-Low							

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

Summative assessment						
Bloom's Level	Continuous Assessment (IAE)				Practical	Final Examination (FE) [50marks]
	Theory Marks				Rubric based CIA [20 Marks]	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]		
Remember	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

23PH202	MATERIALS PHYSICS		L	T	P	C
	(Common to Aero, Agri, Civil, FT, Mech, PCT & SF)		3	0	2	4

Nature of Course	Basic Sciences
Pre requisites	Fundamentals of Basic Physics

Course Objectives

The course is intended to

1. Impart knowledge in production of laser and their applications in engineering and medical field.
2. Understand on the concept and properties of matter like elasticity and its applications.
3. Provide a valuable theoretical introduction and an overview of the fundamental structures of the crystal physics.
4. Apply the concepts of thermal conductivity to solve the thermal coefficents.
5. Give an idea on new engineering materials like shape memory alloys, metallic glasses and nanomaterials.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Compare the types of lasers for various industrial applications.	Understand
CO 2	Study the elastic behavior and working of torsional pendulum.	Understand
CO 3	Account for how crystalline materials are studied using miller indices, including concepts like coordination number and packing factor.	Understand
CO 4	Demonstrate the thermal conductivity of good and bad conductors.	Apply
CO 5	Explain a conceptual understanding about the properties of new engineering materials like shape memory alloys, metallic glasses and nanomaterials.	Apply

Course Contents

Module – I	LASER PHYSICS	9

Lasers: Introduction- characteristics of laser - population of energy levels, Einstein's A and B coefficients derivation - resonant cavity - semiconductor lasers: homojunction and heterojunction - Applications of lasers - particle size determination and holography.

Module – II	PROPERTIES OF MATTER	9

Elasticity - stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever - uniform and non-uniform bending - I-shaped girders.

Module – III	CRYSTAL PHYSICS	9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures.

Module – IV	THERMAL PHYSICS	9
Transfer of heat energy - thermal expansion of solids and liquids - expansion joints - bimetallic strips - thermal conductivity - Forbe's and Lee's disc method: theory and experiment – thermal insulation - applications: heat exchangers in refrigerators, ovens and solar water heaters.		
Module – V	MODERN ENGINEERING MATERIALS	9
Metallic glasses – preparation, properties and applications – Shape memory alloys – Types, characteristics and applications – Nanomaterials – preparation– Physical Vapour Deposition (PVD) - sol gel method, properties and applications. Carbon Nano Tube (CNT) –properties and applications.		

Total : 45 Periods

Laboratory Components (Any Five)

S.No	List of Experiments	CO Mapping	RBT
1	Determination of wavelength and particle size of the given Laser beam.	CO1	Apply
2	Determination of numerical aperture and acceptance angle of an optical fiber.	CO1	Apply
3	Determination of the rigidity modulus of a given wire by using Torsion pendulum.	CO2	Apply
4	Determination of Young's modulus of a material by non-uniform bending method.	CO2	Apply
5	Determination of Young's modulus of a material by uniform bending method.	CO2	Apply
6	Determination of thermal conductivity of a bad conductor by Lee's Disc method.	CO4	Apply
		Total	15 Periods

Text Books

1. Bhattacharya, D.K and Poonam, T, "Engineering Physics", Oxford University Press, 2nd edition, 2015.
2. M.N. Avadhanulu, M.N. &Kshirsagar PG. "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 10th edition, 2014.
3. Singh Dheeraj Kumar, "Nanomaterials", Springer International Publishing, 1st Edition, 2023.

Reference Books

1. David Halliday. Robert Resnick and Jearl Walker., "Principles of Physics", Wiley, 10th Edition, 2014.
2. Raymond A Serway and John W Jewett., "Physics for Scientists and Engineers", Cengage Learning, 9th Edition, 2019.

Web References:

1. https://nptel.ac.in/courses/115/107/115107095/
2. https://spaceplace.nasa.gov/laser/en/
3. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6aMRx

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4. https://nptel.ac.in/courses/113106093

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	1												
CO 2	3	1												
CO 3	3	2	2											
CO 4	3	2	2											
CO 5	3													
	3-High				2-Medium				1-Low					

Summative Assessment

Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	10	10	10			20
Understand	35	35	35		40	60
Apply	5	5	5		60	10
Analyse						10
Evaluate						
Create						

23MC202	ENVIRONMENTAL SCIENCES	L	T	P	C
	(Common for all branches)	2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the concept of eco system and environment.
2. Become conversant with ecological balance and values of biodiversity.
3. Know the role of human in prevention of pollution and making a clean environment.
4. Get knowledge about conservation of non-conventional energy resources.
5. Study about the nature and management of e-waste and solid waste.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Explain the knowledge about ecosystem and environment	Understand
CO 2	Interpret the ecological balance and preservation of bio diversity	Understand
CO 3	Demonstrate various types of pollution in order to control pollution	Apply
CO 4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO 5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Module – I	ECOSYSTEM	6

Eco system - Food chains, Food webs and Ecological pyramids. Ecosystem (a) Forest eco system, (b) Aquatic eco system (pond ecosystem and marine ecosystem).

Module – II	BIODIVERSITY	6

Introduction to Bio diversity, Values of Bio diversity, Threads to Bio diversity, Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

Module – III	ENVIRONMENTAL POLLUTION	6

Definition, Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.

Module – IV	NON-CONVENTIONAL ENERGY RESOURCES	6

Introduction, Types, Working and Applications of: Solar Energy- Photovoltaic (PV) solar energy, Wind Energy-Onshore wind power- and Geo Thermal Energy-Geo thermal power plant.

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Module – V	ENVIRONMENTAL MANAGEMENT	6
Sustainable Development, Waste Management: Types, sources and disposal of municipal, industrial solid Waste, Role of Information technology in Environment and Human. COVID-19 and JN-1 Virus.		

Total : 30 Periods

Activity Components

S.No	List of Experiments	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply

Text Books

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2019.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2020.

Reference Books

1. Santosh Kumar Garg and Rajeshwari Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2nd Edition, 2019.
2. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2020.

Web References:

1. https://nptel.ac.in/courses/122103039/38
2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm
4. www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
5. nptel.ac.in/courses/120108004/module7/lecture8.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1		3					1					3		
CO 2		3					3					1		
CO 3		3					2					3		
CO 4		2					3					2		
CO 5		3					3					2		
	3-High				2-Medium				1-Low					

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Bloom's Level	Summative Assessment				
	Continuous Assessment				
	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [20]	Activity [20]
Remember	20	20	15		
Understand	30	25	25		
Apply		5	10		
Analyze					
Evaluate					
Create					

23CS203	PROBLEM SOLVING USING PYTHON	L	T	P	C
	(Common to AERO, CIVIL, FT, MECH, PCT, S&F)	3	0	2	4

Nature of Course	Engineering Sciences
Prerequisites	Mathematical and Logical Knowledge

Course Objectives

The course is intended

1. Learn the basics of algorithmic problem solving.
2. Think logically and write algorithms and draw flow charts for problems.
3. Make use of python functions and call them.
4. Utilize the Python data structures — lists, tuples, dictionaries and files.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Recall algorithmic solutions to simple computational problems and read,write, execute by simple python programs	Remember
CO 2	Classify and Read, Write, Execute by hand simple python programs.	Understand
CO 3	Structure simple python programs for solving problems.	Understand
CO 4	Examine simple Python programs using conditionals and loops for solving problems	Apply
CO 5	Show the python string functions and lists	Apply
CO 6	Practice the compound data using python Tuples, Dictionaries, Files and Packages.	Apply

Course Contents

MODULE – I   Basics of Computers & Problem solving   9

Computer Basics–Components-Computer organization-Computer Software-Types of software - Software Development steps -Need for logical analysis and thinking- Algorithms –Flowchart.

MODULE – II   Introduction of Python Programming   9

Introduction- Python IDLE Installation- Python Interpreter- Interactive and script mode-Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.

MODULE – III   Control statements and Functions   9

Conditional (if), alternative (if-else), chained conditional (if-elif-else)- Iteration- while,for,break,continue, pass – Functions - Introduction, inbuilt functions, user defined functions, recursion.

MODULE – IV   Strings, Lists   9

Strings- String slices, immutability, string methods and operations- Lists- creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions.

MODULE – V   Tuples, Dictionaries, Files and Packages   9

Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries- operations and methods, Files and Exception-Text files, reading and writing files.

Total : 45 Periods

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple Computational problems.	CO1	Apply
2	Write a program to perform different arithmetic operations on numbers in python.	CO1	Apply
3	Write a python program to implement the various control structures.	CO2	Apply
4	Write a python program for computational problems using recursive function.	CO2	Apply
5	Demonstrate use of list for data validation.	CO3	Apply
6	Develop a python program to explore string functions.	CO3	Apply
7	Write a python program to find a given number is ODD or EVEN	CO4	Apply
8	Write a python class to reverse a string word by word	CO4	Apply
9	Develop python programs to perform operations on dictionaries.	CO5	Apply
10	Write a python program to read and write into a file.	CO5	Apply

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 1st Edition 2021.
2. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 1st Edition 2019.

Reference Books

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2nd Edition 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 1st Edition 2020.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2nd Edition 2019.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 1st Edition 2015.

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Additional References

1. Python Research Association of India - https://www.araiindia.com/services/technology-and-products
2. NPTEL - https://nptel.ac.in/courses/107/106/107106088/
3. MOOC Courses - https://www.mooc-list.com/tags/automotive-engineering

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	3							3	3	3	3
CO2	3	3	3	2	3							3	3	3	3
CO3	3	3	3	2	3							3	3	3	3
CO4	3	3	3	2	3							3	3	3	3
CO5	3	3	3	2	3							3	3	3	3
CO6	3	3	3	2	3							3	3	3	3
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						Final Examination (Theory) [50]
	Continuous Assessment						
	Theory				Practicals		
	IAE-I[5]	IAE-II[10]	IAE-III[10]	Attendance[5]	Rubric Based CIA [10]	Model Examination [10]	
Remember	10	10	10		20		20
Understand	20	20	20		20		40
Apply	20	20	20		10		40
Analyze							
Evaluate							
Create							

Passed in Board of Studies

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23ME202	MECHANICAL ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	2	1

Nature of Course	Engineering Sciences
Prerequisites	Fundamentals of Science

Course Objectives

The course is intended to

1. To practice butt joints, lap joints, and T-joints by metal arc welding.
2. To fabricate models using sheet metal
3. To make joints using carpentry tools.
4. To provide hands-on training in drilling practice
5. To build pipeline as per location and functional requirements.

Course Outcomes

On successful completion of the course, the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Experiment with arc welding equipment to join the structures	**Apply**
CO 2	Make the models using sheet metal	**Apply**
CO 3	Fabricate joints in carpentry components	**Apply**
CO 4	Construct the methods of a drilling operation	**Apply**
CO 5	Carry out basic types of pipe connections including plumbing works	**Apply**

List of Exercises

S.No	Exercises	CO Mapping	RBT Level
	Welding		
1	Lab Joint Using Arc Welding		
2	Butt Joint Using Arc Welding		
3	Tee Joint Using Arc Welding		
	Sheet Metal		
4	Fabrication of Tray Using Sheet Metal		
5	Fabrication of Cone Using Sheet Metal		
	Carpentry		
6	Cross Lab Joint Using Wood		
7	Tee Lab Joint Using Wood		
8	Dove-Tail Joint Using Wood		
	Special Machines		
9	Drilling of Hole in The Given Work Piece		
	Plumbing		
10	External Thread Cutting		
11	Domestic Water Pipe Line Connection.		

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COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1			3									2	2		
CO 2			3									2	2		
CO 3			3									2	2		
CO 4			3									2	2		
CO 5			3									2	2		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

3-High	2-Medium	1-Low

Summative Assessment based on continuous and Final Examination		
Bloom's Category	**Rubrics-based continuous assessment [60 Marks]**	**Final Examination [40 Marks]**
Remember		
Understand	30	20
Apply	30	20
Analyse		
Evaluate		
Create		

Passed in Board of Studies

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23MA301	TRANSFORMS AND BOUNDARY VALUE PROBLEMS (Common to Aero, Agri, Civil, ECE, EEE, FDT, Mech, PCT, S&F)	L	T	P	C
		3	0	2	4

Nature of Course	Basic Sciences
Pre requisites	Foundations of Mathematics

Course Objectives

The course is intended to

1. Learn about linear and non-linear partial differential equations and obtain their solutions using various techniques.
2. Gain familiarity with Fourier series.
3. Orient Fourier series techniques to solve one dimensional wave and heat equations.
4. Provide the concept of Fourier transforms and its inverse.
5. Introduce the concept of Z-transforms and difference equations.
6. Utilize advanced mathematical techniques to solve complex boundary value problems, reflecting mastery in mathematical transformations.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify linear and non-linear partial differential equations.	Apply
CO2	Construct the Fourier series of a given function and apply in the field of Engineering.	Apply
CO3	Interpret solutions of one dimensional wave and heat equations.	Apply
CO4	Implement Fourier transforms in engineering field .	Apply
CO5	Illustrate the Z-transforms and difference equations.	Apply
CO6	Develop mathematical techniques to solve the boundary value problems.	Apply

Course Contents:

Module – I	PARTIAL DIFFERENTIAL EQUATIONS	9

Solution of standard types of first order non-linear partial differential equations: (i) $f(p,q)=0$, (ii) Clairaut's type - Lagrange's linear equation - linear partial differential equations of second order with constant coefficients of homogeneous equations.

Module – II	FOURIER ANALYSIS	9

Dirichlet's Conditions - Fourier series for periodic functions - Expansion of periodic functions with period $(0, 2\pi)$ and period $(-\pi, \pi)$ – Half Range Series - Root mean square value - Parseval's identity – Harmonic Analysis.

Module – III	FOURIER TRANSFORMS	9

Statement of Fourier integral theorem – Fourier transforms pair: Fourier transforms and Inverse Fourier transforms – Fourier sine transforms -Fourier cosine transforms – Transforms of simple functions – Convolution Theorem - Parseval's Identity.

Module – IV	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	9

Z-transforms - Properties – Inverse Z-transform: Partial fraction method and Convolution theorem - Formation of difference equations –Solution of difference equations using Z – transform.

Module – V	APPLICATIONS TO PARTIAL DIFFERENTIAL EQUATIONS	9

Classification of second order Partial differential equations – Method of separation of variables – Solutions of one dimensional wave equation – Solutions of one dimensional heat equation – Application to Boundary value problems.

Total: 45 Periods

Text Books:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., 3rd edition, 2016.
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2021.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 2014.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 9th Edition, 2017.
2. Ramana.B.V,"Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, 4th Edition, 2017.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Publications, 10th Edition, 2023.

Additional References:

1. https://archive.nptel.ac.in/courses/111/101/111101153
2. https://www.youtube.com/watch?v=ygOjw0_Kh8k.
3. https://archive.nptel.ac.in/courses/111/106/111106111.

Laboratory Components using MATLAB:

S.No	List of Experiments	CO Mapping	RBT
1	Solutions of Clauirat's form	1	Apply
2	Solution of second order homogeneous differential equations with constant coefficients	1	Apply
3	Fourier Series in $(0, 2\pi)$	2	Apply
4	Harmonic Analysis in Fourier Series	2	Apply

5	Fourier Transform	3	Apply
6	Inverse Fourier Transform	3	Apply
7	Z - Transform	4	Apply
8	Inverse Z - Transform	4	Apply
9	One dimensional wave equation	5	Apply
10	One dimensional heat equation	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										2		
CO2	3	2	2										2		
CO3	3	2	1										2		
CO4	3	2	1										1		
CO5	3	3	2										2		
CO6	3	2	2										2		
	3	High			2	Medium					1		Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

CHAIRMAN-BOARD OF STUDIES

23ME301	Engineering Thermodynamics	L	T	P	C
		3	1	0	4
Nature of course	Professional Core				
Pre requisites	Engineering Mathematics and Physics				

Course Objectives

The course is intended to

1. Acquire knowledge on thermodynamic systems, properties, laws of thermodynamics, entropy.
2. Examine different thermal systems using the first and second laws of thermodynamics.
3. Improve your ability to solve thermodynamic system problems utilizing a variety of relations.
4. Study the thermodynamic properties of pure substances and its phase change processes.
5. Identify the ideal and real gases equations of state.
6. Use thermodynamic relations to estimate the various properties of the gas mixture.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Explain the thermodynamic properties and Solve the problems related to closed and open systems.	Understand
CO 2	Select the second law of thermodynamics and entropy principle to various thermodynamic systems.	Apply
CO 3	Use the various thermodynamic relations to available and unavailable energy.	Apply
CO 4	Calculate the properties of steam using PV diagrams, H-S diagrams and steam power cycle.	Apply
CO 5	Determine the properties of ideal gases, real gases and gas mixtures using gas laws.	Apply

Course Contents

Module – I   Basic Concepts and First Law of Thermodynamics   12

Basic Concepts: Microscopic and Macroscopic approaches, Thermodynamic systems, Control volume, Thermodynamic properties, Processes, Cycle, Thermodynamic equilibrium, Quasi-static process, Work and Heat transfer, Displacement work and other modes of work, Point and path function, Specific heats, Zeroth law of thermodynamics, First Law of Thermodynamics: First law for flow and non flow processes, various modes of energy, internal energy and enthalpy, Steady Flow Energy Equation (SFEE), Examples of steady flow processes, PMM-1, Limitations of the First Law.

Module – II   Second Law of Thermodynamics and Entropy   12

Second law of thermodynamics: Definition of heat engine, heat pump and refrigerator, thermal efficiency and COP, Kelvin-Planck and Clausius statements, Equivalence of Kelvin-Planck and Clausius statements, Reversibility and Irreversibility, Carnot cycle. Entropy: Clausius Inequality, Definition of Entropy, Entropy change in reversible and Irreversible process, Principle of increase of entropy, Entropy generation in a closed system and open system.

Module – III   Availability and Thermodynamic Relations   12

Availability: Available and unavailable energy, concept of availability, irreversibility, Maximum Work in a Reversible Process, Availability applied to Non - Flow and Flow Processes. Thermodynamic relations: Helmholtz and Gibbs functions, Maxwell relations, Coefficient of volume expansion and isothermal compressibility, T-ds relations, Joule-Thomson coefficient, Clausius Clapeyron equation.

Module – IV   Properties of Pure Substance and Rankine cycle   12

Properties of pure substances: Formation of steam and its thermodynamic properties, P-V, P-T,T-S and H-S Diagrams for a Pure Substance, Quality and Dryness Fraction, Use of Steam Tables and Mollier Chart for thermodynamic Processes, Determination of dryness fraction, Application of thermodynamic laws for pure substances, Rankine Cycle: Basic Rankine cycle – Rankine cycle with reheating and regeneration.

Module – V   Ideal, Real Gases and Gas Mixtures   12

Ideal and Real Gases: Definition, Equations of state for ideal and real gases -Vander Waal's equation, Reduced properties-.Compressibility factor, Generalized Compressibility Chart and its use. Gas mixtures: Mole Fraction, Mass fraction, Dalton's Law of partial pressure, Equivalent Gas constant and Molecular Internal Energy, Enthalpy, Specific Heats and Entropy of Mixture of perfect gases and vapour.

Total : 60 Periods

Note: Steam Tables with Mollier Chart and Compressibility Chart shall be supplied during Examination.

Text Books
1. Yunus A. Cengel and Michael A. Boles, Thermodynamics: An Engineering Approach, Tata-McGraw Hill Pub, 10th Edition, 2023.
2. P. K. Nag, Engineering Thermodynamics, Tata-McGraw Hill Pub, 6th Edition, 2017.

Reference Books
1. Rajput, Engineering Thermodynamics, Laxmi Publications, 5th Edition, 2010
2. Gordon J. Van Wylan& Richard E. Sonntagg, Fundamentals of Thermodynamics, Wiley Eastern Ltd, 7th Edition, 2009.
3. Dr.R.Yadav, Fundamentals of Engineering Thermodynamics, Central Publishing House, Revised 7th Edition, 2016.

Additional References
1. http://nptel.ac.in/courses/112104113/
2. http://nptel.ac.in/courses/112108148/

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	1										3		
CO 2	3	2	1										3		
CO 3	3	3	2										2		
CO 4	3	3	2										2		
CO 5	3	3	1										2		
	3	High				2	Medium				1	Low			

Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand/Apply	Tutorial Class / Assignment	5	15
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations			Final Examination (100)
	IAE – 1 (5)	IAE – 2 (10)	IAE – 3 (10)	
Remember	20	10	10	20
Understand	30	10	10	20
Apply		30	30	60
Analyze				
Evaluate				
Create				

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23ME302	**Engineering Materials and Metallurgy** (Common to Aero & Mech)	L	T	P	C
		3	0	0	3
Nature of course	Professional Core				
Pre requisites	Material Physics				

Course Objectives

The course is intended to

1. Develop the knowledge on the phase diagram of Iron and Steel.
2. Transfer knowledge on ferrous and non ferrous alloys.
3. Give the awareness on Heat treatment of Steels.
4. Acquire the knowledge on non metallic materials.
5. Identify the testing methods to determine the properties of materials.
6. Provide the knowledge on material science and their applications.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Interpret the phase changes, structures, properties and applications of steel and cast iron	Understand
CO 2	Relate the behaviour of Ferrous and Non Ferrous Alloys	Understand
CO 3	Demonstrate the heat treatment process of steels.	Understand
CO 4	Outline the process, structure and applications of Non metallic materials and composites.	Understand
CO 5	Prefer the actions of materials under several loading conditions.	Apply

Course Contents

Module –I   Alloys and Phase Diagrams   9

Constitution of alloys – Phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – Carbon equilibrium diagram. Classification of steels and cast Iron.

Module -II   Ferrous and Nonferrous Alloys   9

Effect of alloy additions on steel - Stainless and tool steels – HSLA, Maraging steels - Al-Cu alloys – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

Module-III   Heat Treatment of Steel   9

Definition – Full annealing, stress relief, recrystallization and spheroidising – normalizing, Hardenability-Jominy end quench test - case hardening, carburizing, nitriding and cyaniding – Flame and Induction hardening.

Module-IV   Non Metallic Materials   9

Polymers – types of engineering polymers, Properties and applications of various thermo and thermosetting polymers–PE, PP,PVC, ABS, PMMA, PS, Urea and Phenol formaldehydes- Engineering Ceramics - Al_2O_3, SiC, Si_3N_4 and SIALON –Introduction to composite materials.

Module-V   Testing of Materials   9

Testing of materials under tension, compression and shear loads – Brinel, Rockwell and Vickers Hardness tests, Impact test - Izod and Charpy, fatigue and creep tests. Mechanism of plastic deformation-slip and twinning.

Total : 45 Periods

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Text Books
1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th Indian Reprint 2009.
2. Williams D Callister, "Material Science and Engineering" 2nd edition Wiley India Pvt Ltd, Revised Indian Edition 2014.

Reference Books
1. Dieter, G.E. "Mechanical Metallurgy",3rd Edition McGraw-Hill, 2017.
2. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 6th Edition 2015.
3. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 9th Edition, 2013.

Additional / Web References
1. https://nptel.ac.in/courses/112/108/112108150/#
2. http://www.issp.ac.ru/ebooks/books/open/Materials_Science_and_Technology.pdf

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	2	2										2	2	
CO 2	3	2	2										2	2	
CO 3	3	2	2										2	2	
CO 4	3	2	2										2	2	
CO 5	3	2	2										2	2	
	3	High			2	Medium				1	Low				

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Formative assessment

Bloom's Level	Assessment Component	Marks	Total marks
Remember	Quiz	5	
Understand	Assignment	5	15
	Attendance	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations			Final Examination (60)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	
Remember	10	10	10	20
Understand	40	40	20	60
Apply			20	20
Analyze				
Evaluate				
Create				

Passed in the Board of Studies   *Approved in Academic Council*

CHAIRMAN - BOARD OF STUDIES

20ME303	Fluid Mechanics and Machinery	L	T	P	C
		3	0	0	3
Nature of course	Professional Core				
Pre requisites	Engineering mechanics				

Course Objectives

The course is intended to
1. Know the properties of fluids and concept of control volume.
2. Learn the conservation laws of flow through pipes.
3. Understand the importance of dimensional analysis
4. Understand the importance of various types of flow in pumps.
5. Understand the importance of various types of flow in turbines.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Identify the fluid properties and measure the flow characteristics	Apply
CO 2	Evaluate the loss of energy in flow through pipes	Evaluate
CO 3	Model the relationships for the flow parameters of fluids.	Apply
CO 4	Examine the performance of pumps for a given application	Analyse
CO 5	Select suitable turbine for given application and evaluate the operating characteristics	Apply

Course Contents

Module –I   Fluid Properties and Flow Characteristics   9

Units and dimensions- Properties of fluids, Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

Module –II   Flow Through Circular Conduits   9

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuliBoundary layer concepts – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

Module –III   Dimensional Analysis   9

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

Module –IV   Pumps   9

Impact of jets - Euler"s equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - pumps– working principle - work done- performance curves.

Module –V   Turbines   9

Classification of turbines – heads and efficiencies – velocity triangles. working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

Total : 45 Periods

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Text Books
1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 22nd edition, 2019.
2. Kumar K. L., "Engineering Fluid Mechanics", Tata-McGraw Hill , 4th Edition, 2017.

Reference Books
1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
3. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co.,9th edition 2017

Additional / Web References
1. http://www.efluids.com/
2. https://www.quora.com/What-is-fluid-machines
3. https://nptel.ac.in/courses/112104117/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
Cos	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	2	3										1	2	
CO 2	3	2	3										1	2	
CO 3	3	2	3										1	2	
CO 4	3	3	2										1	2	
CO 5	3	2	3										1	2	
	3	**High**			**2**	**Medium**				**1**	**Low**				

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Understand	Online Quiz	5	
Apply	Tutorial Class / Assignment	5	15
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination** **(60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember				
Understand	20	20	20	40
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

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23ME305	Manufacturing Technology-I	L	T	P	C
		3	0	2	4
Nature of course	Professional Core				
Pre-requisites	Fundamentals of Mechanical Engineering				

Course Objectives:

The course is intended to

1. Describe the various aspects of different manufacturing techniques and casting methods
2. Developing a broad knowledge of welding methods for making various joints using different techniques.
3. Demonstrate the metal forming processes such as Hot and Cold Working, Rolling, Forging, Extrusion, and Drawing.
4. Acquire knowledge about the tools, equipment, machinery, and operations required for these metal forming processes.
5. Developing the basic concepts of plastic components in manufacturing processes.
6. Understand and compare the functions and applications of different manufacturing technology process tools.

Course Outcomes:

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Choose different metal casting processes, associated defects, merits and demerits.	Understand
CO 2	Categories and select appropriate different metal joining processes using various techniques.	Understand
CO 3	Identify various hot-working and cold-working methods of metals.	Understand
CO 4	Design various sheet metal-making processes.	Apply
CO 5	Organize various methods of manufacturing plastic components.	Apply

Course Contents

Module– I Metal Casting Processes 9

Principles of special casting processes; advantages and applications of metal casting, patterns, pattern making, pattern materials, pattern types, pattern allowances, and mold materials. Sand Casting, Molding machines – Melting furnaces, shell molding, investment casting, pressure die casting, centrifugal casting, CO_2 process, stir casting, Defects in Sand casting process remedies.

Module– II Metal Joining Processes 9

Introduction: Gas tungsten arc welding, Gas metal Arc welding, submerged arc welding, resistance welding, plasma arc welding, thermit welding, friction stir welding, brazing and soldering, Welding defects – inspection & remedies – Adhesive bonding.

Module– III   Metal Forming Process   9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging Types of Rolling, Defects in rolled parts – Principle of rod and wire drawing – Tube drawing Principles of Extrusion – Types – Hot and Cold extrusion.

Module– IV   Sheet Metal Processes   9

Sheet metal forming methods – Bending Operation, Shearing, Bending, Blanking, Stretch Forming, Deep Forming. Spinning. High-velocity forming, Explosive forming, Electro-hydraulic forming - magnetic pulse forming, pneumatic and mechanical high velocity forming.

Module– V   Manufacture of Plastic Components   9

Types and characteristics of plastics – Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – introduction to blow molding, Rotational molding, Film blowing, injection molding, extrusion, Thermoforming, bonding of thermoplastics.

Total: 45 Periods

Laboratory Component:

S.No.	Name of the Experiment	CO Mapping	RBT
1	Preparation of greensand mold for solid pattern	CO1	Apply
2	Preparation of greensand mould for split pattern	CO1	Apply
3	Joining of Lap Joint Using Arc Welding	CO2	Apply
4	Joining of Butt Joint Using Arc Welding	CO2	Apply
5	Joining of Tee Joint Using Arc Welding	CO2	Apply
6	Cold forming of round shape to square	CO3	Apply
7	Cold forming of round shape to hexagon	CO3	Apply
8	Preparation of Tray Using Sheet Metal	CO4	Apply
9	Preparation of Funnel Using Sheet Metal	CO4	Apply
10	Basic Connection Involving PVC / GI Pipes and Pipe Fittings	CO5	Apply
11	Joining process of T-Joint in plastics	CO5	Apply

Total: 30 Periods

Text Books
1. P.N .Rao Manufacturing Technology Volume 1 Mc Graw hill Education 5th edition, 2018.
2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India,4th Edition, 2013.

Reference Books
1. Hajra Choudhury S.K, Hajra Choundhury A.K, and Nirjhar Roy, "Elements of Workshop Technology", Vol. 1, 2017 2.
2. HMT, "Production Technology", "McGraw Hill Education", 2017.

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3. Rajput.R.K, "A Textbook of Manufacturing Technology", 2nd ed., Laxmi Publications (P) Ltd, 2016

Additional / Web References
1. https://nptel.ac.in/courses/112107145/17
2. https://nptel.ac.in/courses/112107083/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	3	2										1	2	
CO 2	3	3	2										1	2	
CO 3	3	3	2										1	2	
CO 4	3	3	2										1	2	
CO 5	3	3	2										1	2	
	3	**High**			**2**	**Medium**				**1**	**Low**				

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	
Understand	Tutorial Class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Examinations**		**Assessment**	**Final Examination (100)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III(10)**	
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyze				
Evaluate				
Create				

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23ME305	Computer Aided Machine Drawing Laboratory	L	T	P	C
		0	0	2	1
Nature of course	Professional Core (PC)				
Pre requisites	Engineering Drawing				

Course Objectives
The course is intended to
1. Apply the Indian Standards and practice thread forms, fasteners, keys, joints, and couplings to impart knowledge
2. Visualize the machine components drawing leading to the preparation of Assembly drawings manually and using CAD with Geometric Dimensioning and Tolerancing (GD&T).
3. Experiment with the basic principles associated with CAD and demonstrate common drafting techniques and shortcuts used by professionals.
4. Utilize the advancements of CAD and their capabilities that can be used to increase the productivity.
5. Suggest information about the CAD in the industry and use its resources.
6. Prepare part and assembly drawings, bill of material of machine components and values using CAD Software.

Course Outcomes
On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Develop the draft of components such as flange couplings and screw jacks, adhering to industry standards and conventions, and including detailed annotations and dimensioning.	Apply
CO2	Construct 2D drawings of mechanical components such as plumber blocks and universal joints.	Apply
CO3	Draft sleeve and cotter joints as per industry standards and conventions including detailed annotations, dimensioning.	Apply
CO4	Demonstrate a clear understanding of the design principles and mechanical functions of the knuckle joints component.	Apply
CO5	Apply industry standards and conventions in drafting crossheads including detailed manufacturing and professional communication.	Apply
CO6	Interpret and create detailed and precise technical drawings of mechanical components stuffing boxes and connecting rods	Apply

Introduction to GD&T- Size (S)- Form (F)- Datums Control- Location (L)- Orientation (O)- Material Modifiers- Profile Tolerances- Runout Tolerances- Outcast Symbols to Avoid Concentricity, Symmetry

S.no	Particulars	CO's	Blooms Taxonomy
Geometric Modeling And Assembly			
Study	Study of AutoCAD	CO1	Understand
1.	2D Drafting of Flange Coupling	CO1	Apply
2.	2D Drafting of Screw Jack	CO1	Apply
3.	2D Drafting of Plumber Block	CO2	Apply
4.	2D Drafting of Universal Joint	CO2	Apply
5.	2D Drafting of Sleeve and Cotter Joint	CO3	Apply
6.	2D Drafting of Knuckle Joint	CO4	Apply

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7.	2D Drafting of Cross Head	CO5	Apply
8.	2D Drafting of Stuffing Box	CO6	Apply
9.	2D Drafting of Connection Rod	CO6	Apply
			Total : 30 Periods

Text Books
1. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013

Reference Books
1. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 50th Edition, Charotar Publishers, 2014.
2. Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2004.
3. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing", published by Tata McGrawHill, 2006

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3		3	1	3					2			3	1	
CO 2	3		3	1	3					2			3	1	
CO 3	3		3	1	3					2			3	1	
CO 4	3		3	1	3					2			3	1	
CO 5	3		3	1	3					2			3	1	
CO 6	3		3	1	3					2			3	1	
	3		High		2		Medium		1		Low				

Assessment based on Continuous and Final Examination			
Bloom's Level	**Continuous Assessment (60 marks) (Attendance – 5 marks)**		**Final Examination [40 marks]**
	Rubric based Continuous Assessment [30 marks]	**Model Examination [25 marks]**	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

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23ME306	Strength of Materials and Fluid Mechanics Laboratory	L	T	P	C
		0	0	2	1
Nature of course	Professional core				
Pre requisites	Strength of Materials and Fluid Mechanics, Engineering materials and metallurgy				

Course Objectives:

The course is intended to

1. Learn the principles in Fluid Mechanics theory by performing experiments in lab.

2. Study the mechanical properties of materials when subjected to different types of loading.

3. Know the principles studied in Fluid Mechanics theory by performing experiments in lab.

4. Experiment the fundamental principles of mechanics of materials (strength of materials)

5. Measure mechanical properties of deformable bodies.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Select the measurement equipment's for flow measurement.	Apply
CO 2	Examine the performance of different fluid machineries.	Apply
CO3	Experiment with Tensile and double shear tests	Apply
CO4	Utilize torsion and Impact tests.	Apply
CO5	Make use of Hardness and Deflection tests.	Apply

S.No.	Fluid Mechanics - List of Experiments	CO Mapping	Bloom's Level
1	Determination of the Coefficient of discharge of given Orifice meter and Venturi meter.	CO 1	Apply
2	Calculation of the rate of flow using Rota meter	CO 1	Apply
3	Conduct experiments and drawing the characteristic curves of Gear pump.	CO 1	Apply
4	Conducting experiments and drawing the characteristic curves of centrifugal pump / submergible pump	CO 2	Apply
5	Conducting experiments and drawing the characteristic curves of reciprocating pump	CO 2	Apply
6	Conducting experiments and drawing the characteristic curves of Pelton wheel.	CO 2	Apply

			Total : 30 Periods
S.No.	**Strength of Materials - List of Experiments**	**CO Mapping**	**Bloom's Level**
1.	Tension test on a mild steel rod	CO3	Apply
2.	Double shear test on Mild steel and Aluminium rods	CO3	Apply
3.	Torsion test on mild steel rod	CO4	Apply
4.	Impact test on metal specimen	CO4	Apply
5.	Hardness test on metals - Brinnell and Rockwell Hardness Number	CO5	Apply
6.	Deflection test on beams	CO5	Apply
			Total : 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	2		3									1	2	
CO 2	3	2		3									1	2	
CO 3	3	2		3									1	2	
CO 4	3	2		3									1	2	
CO 5	3	2		3									1	2	
3	**High**					**2**	**Medium**						**1**	**Low**	

Assessment based on Continuous and Final Examination			
Bloom's Level	**Continuous Assessment (60 marks) (Attendance – 5 marks)**		**Final Examination [40 marks]**
	Rubric based Continuous Assessment [30 marks]	**Model Examination [25 marks]**	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

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23UH001	UNIVERSAL HUMAN VALUES (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	0	0	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Encourage respect for the inherent dignity and worth of all individuals, regardless of differences in race, ethnicity, gender, religion, or socioeconomic status.
2. Cultivate empathy and compassion towards others, promoting understanding and solidarity across diverse communities.
3. Promote peaceful coexistence and harmony among individuals and communities.
4. Foster a sense of responsibility towards the environment and future generations, promoting sustainable practices and conservation efforts.
5. Hold and celebrate cultural diversity, recognizing the richness and value of different traditions, languages, and perspectives.
6. Contribute to the realization of universal human values and create a more just, compassionate, and sustainable world.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Embrace values such as empathy, tolerance, and respect can lead to decreased conflict and violence, both at interpersonal and societal levels.	Understand
CO 2	Support values like equality, justice, and human rights can lead to more equitable societies, where everyone has access to opportunities and resources	Understand
CO 3	Emphasize values such as empathy, compassion, and honesty fosters healthier and more meaningful relationships among individuals and groups.	Apply
CO 4	Grasp values of environmental stewardship and responsibility contributes to sustainable development practices that preserve natural resources.	Apply
CO 5	Celebrate cultural diversity and promoting values of inclusivity and acceptance enriches societies by fostering creativity, innovation, and mutual understanding	Understand
CO 6	Create a world that is more just, compassionate, and sustainable for all.	Apply

Course Contents

Module – I	NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION	9

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration – what is it? – Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility - the basic requirements for fulfilment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly -

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A critical appraisal of the current scenario – Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Module – II	UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!	9

Understanding human being as a co-existence of the sentient 'I' and the material 'Body' – Understanding the needs of Self ('I') and 'Body'- happiness and physical facility – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) – Understanding the characteristics and activities of 'I' and harmony in 'I' – Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.

Module – III	UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP	9

Understanding values in human - human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship – Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship – Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society-Undivided Society, Universal Order- from family to world family.

Module – IV	UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE-WHOLE EXISTENCE AS COEXISTENCE	9

Understanding the harmony in the Nature – Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature – Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.

Module – V	IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS	9

Natural acceptance of human values – Definitiveness of Ethical Human Conduct – Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics – Case studies of typical holistic technologies, management models and production systems – Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

Total : 45 Periods

Text Books

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
3. A N Tripathy, Human Values, New Age International Publishers, 2003.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
3. Human Values, A. N. Tripathi, New Age Intl.Publishers, NewDelhi, 2004.

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Web References

1. https://www.studocu.com/in/document/i-k-gujral-punjab-technical-university/universal-human-values/uhv-complete-notes/46743542.
2. https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1Kyqte ziTbTjN1So
3. https://www.youtube.com/watch?v=Ff0LUTOCuLE&list=PLWDeKF97v9SO8vvjC1Kyqte ziTbTjN1So&index=16

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	Pos 1	2	3	4	5	6	7	8	9	10	11	12	PSOs 1	2
CO 1									1	2	1		1	
CO 2									1	2	1		1	
CO 3									1	2	1		1	
CO 4									1	2	1		1	
CO 5									1	2	1		1	
	3-High				2-Medium				1-Low					

Formative assessment

Bloom's Level	Continuous Assessment (IAE)		Total marks
	Assessment component	Marks	
Remember	Online Quiz	5	
Understand	Tutorial class/Assignment	5	15
	Attendance	5	

Summative assessment

Bloom's Level	Continuous Assessment (IAE) Theory Marks			Final Examination [60 marks]
	IAE-I [5]	IAE-II [10]	IAE-III [10]	
Remember	20	10	10	10
Understand	30	20	20	20
Apply		20	20	20
Analyse				
Evaluate				
Create				

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23ME402	Thermal Engineering	L	T	P	C
		3	0	0	3
Nature of course	Professional Core				
Prerequisites	Engineering Thermodynamics				

Course Objectives

The course is intended to
1. Use the concepts, laws, and methodologies from the first course in thermodynamics into the analysis of cyclic processes
2. Construct the various parts of IC engines in thermal applications.
3. Select the steam boilers, their mountings and accessories according to its working principle.
4. Justify the shape of nozzles based on the required performance in the steam turbines.
5. Compare the vapour compression and vapour absorption refrigeration systems.
6. Integrate the thermodynamic and psychometric processes in the air conditioning systems.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Implement the thermodynamic concepts to different air standard cycles and solve problems.	Apply
CO 2	Demonstrate the I.C. engine components, actual and theoretical P-V diagram, valve and port timing diagram of two-stroke and four-stroke engines.	Apply
CO 3	Select the low and high-pressure boilers and its mountings based on its construction and operation.	Apply
CO 4	Compare the impulse and reaction turbines based on the shapes and functions of the steam nozzle.	Analyse
CO 5	Differentiate the operation and principle of thermal cooling systems used in refrigeration and air-conditioning systems.	Analyse

Course Contents

Module-I Gas Power Cycles 9

Introduction - Air Standard Cycles – Assumptions, Otto, Diesel, Dual, and Brayton – Cycle Performance Analysis and Comparisons.

Module-II Internal Combustion Engines 9

IC engine Classification, components, and functions. P-V diagram - Valve and port timing diagram, Two-stroke, and four-stroke engines - Petrol and diesel engine – Ignition, Fuel injection system, Cooling systems

Module-III Steam Boilers 9

Classification of steam boilers - Difference between fire tube and water tube, low pressure and high-pressure boilers - super-critical boiler - Boiler mountings and accessories

Module-IV Steam Nozzles and Steam Turbines   **9**

Nozzles and their shapes, Friction in a nozzle, Maximum discharge through a nozzle. Introduction - Classification of steam turbines, compounding.

Module-V Refrigeration and Air Conditioning systems   **9**

Refrigeration systems - Vapour compression, vapour absorption system- Comparison - Simple air-conditioning cycle- working principle of the air-conditioning system.

Total: 45 Periods

Text Books
1. Arora.C.P, "Refrigeration and Air conditioning", McGraw Hill publication, 4th edition, 2021
2. R.S.Khurmi and J.K.Guptha, "Thermal Engineering", 15th Edition, S.Chand publisher, 2013

Reference Books
1. Rajput, "Thermal Engineering", Laxmi Publications, 10th edition, 2018
2. C.P.Kothandaraman, S.Domkundwar and A.V.Domkundwar, "A course in Thermal Engineering", Dhanpat Rai & Sons, 2014.
3. Rudramoorthy R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003.

Additional References:
1. https://ocw.mit.edu/courses/mechanical-engineering/
2. http://nptel.ac.in/courses/112104033/

<table>
<tr><th colspan="16">Mapping of Course Outcomes (COs) with Programme Outcomes (POs)
Programme Specific Outcomes (PSOs)</th></tr>
<tr><th rowspan="2">COs</th><th colspan="12">POs</th><th colspan="3">PSOs</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>CO 1</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO 2</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO 3</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO 4</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td>CO 5</td><td>2</td><td>3</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>3</td><td></td></tr>
<tr><td></td><td>3</td><td colspan="2">High</td><td></td><td>2</td><td colspan="5">Medium</td><td>1</td><td colspan="3">Low</td></tr>
</table>

<table>
<tr><th colspan="4">Formative assessment</th></tr>
<tr><th>Bloom's Level</th><th>Assessment Component</th><th>Marks</th><th>Total marks</th></tr>
<tr><td>Understand</td><td>Online Quiz</td><td>5</td><td rowspan="3">15</td></tr>
<tr><td>Apply</td><td>Tutorial Class / Assignment</td><td>5</td></tr>
<tr><td></td><td>Attendance</td><td>5</td></tr>
</table>

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| Bloom's Category | Summative Assessment | | | |
| | Internal Assessment Examinations | | | Final Examination (100) |
	IAE – I (5)	IAE – II (10)	IAE – III (10)	
Remember				
Understand	20	20	20	40
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

23ME403	Manufacturing Technology - II	L	T	P	C
		3	0	0	3

Nature of Course	Professional Core
Pre requisites	Manufacturing Technology-I

Course Objectives

The course is intended to

1. List and outline the various metal removal processes.
2. Gain knowledge on various operations of lathe machine.
3. Demonstrate the process of making special components using special purpose machines.
4. Expose the students to various advanced super finishing processes.
5. Recognize the basic concept and various types of broaching machines
6. Examine the basic concepts of rapid prototyping and tooling technology and its applications.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Recall the mechanism of material removal processes	Understand
CO 2	Demonstrate the Constructional and operational features of special purpose machines.	Remember
CO 3	Identify the operational features of advanced super finishing Processes and Broaching machines	Apply
CO 4	Describe the types of computer numerical control machines and Basic concepts of CAD/CAM technology.	Apply
CO 5	Apply the appropriate tooling for rapid prototyping process	Apply

Course Contents

Module – I   Theory of metal cutting   **9**

Types of metal cutting processes: Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

Module – II   Special Purpose Machines   **9**

Shaper — Types of operations. Drilling Machine, reaming, boring, Tapping. Milling operations- types of milling cutter. Gear cutting — forming and generation principle and construction of gear milling, hobbing and gear shaping processes –finishing of gears.

Module – III   Advanced Super finishing Technology   **9**

Abrasive processes: grinding wheel — specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications. Introduction, Lapping, Horning, Buffing, Barrel Tumbling, Burnishing, Powder coating, Polishing. Broaching machines: broach construction — push, pull, surface and continuous broaching machines

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Module – IV   Computer Numerical Controlled Machines   9

Numerical Control (NC) machine tools — CNC types, constructional details, special features, machining centre, part programming fundamentals CNC — manual part programming. Basic concepts of CAD/CAM and their Integration Tools

Module – V   Rapid prototyping and Tooling   9

Introduction to Rapid Prototyping & Rapid Tooling, Green manufacturing. Challenges to manufacturing technology- evolution of precision in manufacturing, tooling and current scenario, requirements and applications

Total : 45 Periods

Text Books

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters 2014
2. SeropeKalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson publication, Singapure, 4th edition, 2014.
3. Rao. P.N "Manufacturing Technology - Metal Cutting and Machine Tools", Tata McGraw-Hill, New Delhi, 4thEdition, 2018.

Reference Books

1. R.K. Jain, "Production Technology" Khanna Publishers, New Delhi, 2015.
2. Rajput, R.K., "A Textbook of Manufacturing Technology", Laxmi publications Ltd, New Delhi, 2nd edition, 2017.
3. Rapid prototyping: Principles and applications, second edition, Chua C.K., LeongK.F., and Lim C.S., World Scientific Publishers, 2003.

Additional References
1. https://nptel.ac.in/courses/112/105/112105126/
2. https://nptel.ac.in/courses/112/104/112104204/
3. https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-me03/

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	1	1			1	1	1					1	3
CO 2	3	1	1			1	1	1					1	3
CO 3	3	1	1			1	1	1					1	3
CO 4	3	1	1			1	1	1					1	3
CO 5	3	1	1			1	1	1					1	3

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

3-High	2-Medium	1- Low

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	
Understand	Tutorial class / Assignment	5	15
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE) (40)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(100)**
Remember	20	10	10	20
Understand	20	20	10	20
Apply	10	20	30	60
Analyse				
Evaluate				
Create				

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Passed in Board of Studies Meeting

Passed in Academic Council Meeting

23ME401	Strength of Materials	L	T	P	C
		3	0	0	3
Nature of course	Engineering Sciences				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to
1. Understand the concepts of stress, strain, principal stresses and principal planes.
2. To provide knowledge about stress structures subjected to axial and thermal loads.
3. Study the stresses and deformations induced in thin and thick shells.
4. Study the concept of shear force and bending moment due to external loads in determinate beams and their effect on stresses.
5. Know the slopes and deflections in determinate beams by various methods.
6. Learn the stresses and deformation in circular shafts and helical spring due to torsion.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Solve the concepts of stress and strain in simple and compound bars with the importance of principal stresses and principal planes.	Apply
CO 2	Examine thin and thick shells for the applied internal and external pressure	Apply
CO 3	Develop the load transferring mechanism in beams and stress distribution due to shear force and bending moment	Apply
CO 4	Construct the slope and deflection in beams using different methods	Apply
CO 5	Apply basic equation of simple torsion in designing of shafts and helical Spring	Apply

Course Contents

Module –I Stress, Strain and Deformation of Solids   12

Rigid bodies and deformable solids - Tension, Compression and Shear Stresses - Deformation of simple and compound bars-Thermal stresses-Elastic constants-Volumetric strains-Stresses on inclined planes - principal stresses and principal planes.

Module –II Thin Cylinders, Spheres and Thick Cylinders   12

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders–spherical shells subjected to internal pressure–Deformation in spherical shells–Lame"s theorem.

Module –III Transverse Loading on Beams and Stresses in Beam   12

Beams–types transverse loading on beams–Shear force and bending moment in beams–Theory of simple bending- bending stress distribution - Load carrying capacity - Proportioning of sections - Shear stress distribution.

Module –IV Deflection of Beams and Columns   12

Slope and Deflection of cantilever and simply supported beams by Double integration method and Macaulay"s method. Theory of Columns - Slenderness ratio, End Conditions, Equivalent length, Euler and Rankine"s formulae.

Module –V Torsion & Springs   12

Torsion formulation, stresses and deformation in circular and hollows shafts–Stepped shafts-Deflection in shafts fixed at the both ends–Stresses in helical springs–Deflection of helical springs.

Text Books

1. Ferdinand P Been, Russell Johnson,J.r. and John J.Dewole "Mechanics of Materials", Tata McGraw Hill Publishing „co. Ltd., New Delhi, 8th edition, 2020.
2. Bansal,R.K., "Strength of Materials", Laxmi Publications (P) Ltd.,6thedition, 2018.

Reference Books

1. R. S.Khurmi, N. Khurmi "Strength of Materials", S.Chand & Co., Ram Nagar, New Delhi, 26th edition, 2018.
2. Hibbeler, R.C., "Mechanics of Materials ", 9th edition, 2013
3. Subramanian R., "Strength of Materials", Oxford University Press, 3rd edition, 2016

Additional References:

1. nptel.ac.in/courses/Web course contents/.../strength%20of%20materials/homepage.htm
2. http://em2.yolasite.com/

COs	POs												PSOs		
---	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	1									2	1	
CO 2	3	3	3	1									2	1	
CO 3	3	3	3	1									2	1	
CO 4	3	3	3	1									2	1	
CO 5	3	3	3	1									2	1	
	3	High			2	Medium				1	Low				

Mapping of Course Outcomes(COs) with Programme Outcomes(POs) Programme Specific Outcomes(PSOs)

Formative assessment

Bloom's Level	Assessment Component	Marks	Totalmarks
Remember	Online Quiz	5	
Understand	Tutorial	5	15
	Assignment	5	

Summative Assessment

Bloom's Category	Internal Assessment Examinations			Final Examination
	IAE–I (5)	IAE–II (10)	IAE–III (10)	(60)
Remember				
Understand	20	20	20	40
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

23MA402	STATISTICAL AND NUMERICAL METHODS (Common to Aero, Agri, Civil, Food, Mech, PCT & S&F)	L	T	P	C
		3	0	2	4

Nature of Course	Basic Sciences
Pre requisites	Foundations of Mathematics

Course Objectives

The course is intended to
1. Acquaint with the knowledge of testing of hypothesis for small and large samples
2. Familiarize with the basic concept on types of design of experiments used in the field of engineering
3. Introduce the basic concepts of algebraic and transcendental equations.
4. Acquire the concept of numerical techniques of differentiation and integration.
5. Study the numerical techniques in solving ordinary differential equations.
6. Equip student with the ability to analyze data and solve mathematical problems using Statistical techniques and numerical algorithm.

Course Outcomes

On successful completion of the course, students will be able to

CO1	Interpret the testing of hypothesis for small and large samples.	Apply
CO2	Explain the basic concepts of classifications of design of experiments in the field of engineering.	Apply
CO3	Demonstrate the algebraic and transcendental equations.	Apply
CO4	Apply the numerical techniques of interpolation and error approximations in various intervals in real life situations.	Apply
CO5	Execute the numerical techniques for solving first and second order ordinary differential equations.	Apply
CO6	Create new statistical techniques and numerical algorithms for data analysis and problem solving.	Apply

Course Contents:

Module – I	TESTING OF HYPOTHESIS	9

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t for single mean and difference of means, Chi-square - Contingency table (test for independent) -Goodness of fit.

Module – II	DESIGN OF EXPERIMENTS	9

One way and two way classifications – completely randomized design – Randomized block design – Latin square design.

Module – III	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	9

Solution of linear system of equations – Gauss elimination method – Gauss Jordan method - Iterative methods of Gauss Jacobi method and Gauss Seidel method– Eigen values of a matrix by Power method

Module – IV	INTERPOLATION AND NUMERICAL INTEGRATION	9
Lagrange's interpolations - Newton's divided difference interpolations – Newton's forward difference and backward difference formulae – Numerical integration using Trapezoidal and Simpson's 1/3 rules.		
Module – V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	9
Single step methods: Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods: Milne's predictor corrector methods for solving first order equations.		

Total: 60 Periods

Text Books:

1. Gupta S.C and Kapoor V.K., Fundamentals of Mathematical Statistics", Sultan chand & sons, New Delhi, 12th Edition, 2020
2. Grewal B.S, and Grewal J.S " Numerical methods in engineering and science "Khanna Publishers, 10th Edition, 2015.
3. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference Books:

1. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, New Delhi, 3rd Edition, 2017
2. Burden, R.L and Faires, J.D, "Numerical Analysis", Cengage Learning, 9th Edition, 2016.
3. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, 8th Edition, 2016.

Additional References:

1. https://pvpsitrealm.blogspot.com/2016/09/higher-engineering-mathematics-by-bs.html
2. https://reference.wolfram.com/language/tutorial/Numerical methods.html
3. https://www.researchgate.net/publication/349657530_Statistics_and_Numerical_Methods

Laboratory Components using MATLAB:

S.No	List of Experiments	CO Mapping	RBT
1	Student's t - test	1	Apply
2	Chi – Square test	1	Apply
3	One way classification	2	Apply
4	Two way classification	2	Apply
5	Gauss Elimination Method	3	Apply
6	Gauss Seidel Method	3	Apply

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7	Lagrange's Interpolation Formula	4	Apply
8	Simpson's 1/3 rd rule	4	Apply
9	Euler's Method	5	Apply
10	Runge – Kutta Method	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	2		
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2		
CO3	3	3	1	-	-	-	-	-	-	-	-	-	1		
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2		
CO5	3	3	2	-	-	-	-	-	-	-	-	-	2		
CO6	3	2	3	-	-	-	-	-	-	-	-	-	2		
	3	High		2	Medium			1	Low						

	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
Bloom's Level	Theory				Practical		
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

(signature)

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Passed in Board of Studies Meeting	Passed in Academic Council Meeting
Passed in Board of Studies Meeting on 08.07.2024	Approved in Academic Council Meeting on 20.07.2024

		L	T	P	C
20ME404	**Engineering Metrology**	3	0	2	4

Nature of course	Professional Core
Pre requisites	Physics for Mechanical Sciences

Course Objectives

The course is intended to

1. Demonstrate the basics of measurement system and experimental errors.
2. Introduce the linear, angular and optical measuring instruments.
3. Impart knowledge on fits, tolerances and gauges design.
4. Determine with surface roughness measurement.
5. Examine the measurement of Displacement, Stress and Strain, and Force and Torque.
6. Use the measurement techniques of Pressure, Fluid flow and Temperature.

Course Outcomes
On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Identify the fundamentals concepts of Measuring system and Errors in Measurement.	Understand
CO2	Apply the principles of linear and angular measurement tools in Industrial applications.	Apply
CO3	Demonstrate the working procedure of Laser Interferometer and Coordinate Measuring Machine (CMM).	Apply
CO4	Discover the techniques of form measurement used for industrial Components.	Apply
CO5	Choose the various measuring instruments used to measure the power, Flow and temperature.	Apply

Course Contents

Module – I   Basics of Metrology   9

Introduction to Metrology – Need – Elements – Work piece, Instruments –Terms associated with measurement: sensitivity, readability, reliability and repeatability – Errors in Measurements – Types – Control – Types of standards.

Module – II Linear and angular Measurements   9

Linear Measuring Instruments – Limit gauges – gauge design – terminology –concepts of interchangeability and selective assembly – Angular measuring instruments – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator.

Module – III Advances in Metrology   9

Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of Coordinate Measuring Machine (CMM), Machine Vision System.

Module – IV Form Measurements 9

Principles and Methods of straightness measurement, Flatness measurement, Thread measurement, gear measurement, surface finish measurement, Roundness measurement –Applications.

Module – V Measurement of power, flow and temperature 9

Force, torque, power - mechanical, Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration.

Total: 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Calibration of Vernier caliper and screw gauge	CO1	Apply
2	Calibration of Vernier height gauge	CO1	Apply
3	Calibration of depth micrometer and bore gauge	CO2	Apply
4	Measurement of angles using bevel protractor	CO2	Apply
5	Calibration using sine bar	CO3	Apply
6	Measurement of gear parameters	CO3	Apply
7	Measurement of surface finish (machined)	CO4	Apply
8	Measurement of surface finish (polished)	CO4	Apply
9	Measurement of force and torque	CO5	Apply
10	Measurement of temperature	CO5	Apply

Total: 30 Periods

Text Books

1. Beckwith, Marangoni, Lienhard, "Mechanical Measurements", Pearson Education, 6th edition 2020.
2. Gupta.I.C.,"Engineering Metrology", Dhanpatrai Publications, 6th edition 2018.

Reference Books

1. Charles Reginald Shotbolt, "Metrology for Engineers", Cengage Learning EMEA, 5th edition1990.
2. Raghavendra, Krishnamurthy "Engineering Metrology & Measurements", Oxford university press, 2016.
3. Jain R.K."Engineering Metrology", Khanna Publishers, 2021.

Additional / Web References

1. https://www.mek.dtu.dk/english/Sections/MPP/Research/Manufacturing-metrology

2. https://tint.edu.in/tict-me-dept-laboratories/metrology-measurement-lab.html

3. http://www.metrology.wat.edu.pl/index.php/links/

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

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

Summative assessment

Bloom's Level	Continuous Assessment				Practical	Final Examination (Theory) [100marks]
	Theory				Rubric based CIA [20Marks]	
	IAE –I [5]	IAE –II [10]	IAE –III [10]	Attendance [5]		
Remember	20	20	10		20	20
Understand	30	20	20		20	20
Apply		10	20		40	60
Analyse						
Evaluate						
Create						

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

23ME405	Thermal Engineering Laboratory	L	T	P	C
		0	0	2	1
Nature of course	**Professional Core**				
Prerequisites	Engineering Thermodynamics and Thermal Engineering				

Course Objectives

The course is intended to
1. Evaluate the various performance tests on IC Engines
2. Study the value timing and port timing diagram of four-stroke and two-stroke engines
3. Determine the flash point and fire point of various oils and lubricants.
4. Analyse the air compressor and blower performance and factors influencing its performance
5. Examine the performance of refrigeration cycle and air conditioning systems.
6. Use the properties of moist air and its application in air conditioning systems.

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Evaluate the various performances of I.C. engines.	Apply
CO 2	Construct the valve timing and port timing diagram, along with the working principle and combustion process of IC engine.	Apply
CO 3	Determine the flash point and fire point of various oils and lubricants.	Apply
CO 4	Explain the working of the air compressor and air blower along with factors influencing its performance	Apply
CO 5	Compute the cooling load for air conditioning and COP of refrigeration systems.	Apply

S. No	List of Experiments	CO Mapping	Revised Blooms Taxonomy
1.	Performance test on 4 – stroke Diesel Engine.	CO 1	Apply
2.	Heat balance test on 4 – stroke Diesel Engine.	CO 1	Apply
3.	Retardation test to find Frictional Power of a Diesel Engine.	CO 1	Apply
4.	Valve timing diagram of a 4-stroke Diesel Engine	CO 2	Apply
5.	Port timing diagram of a 2-stroke Petrol Engine	CO 2	Apply
6.	Determination of flash point and fire point of various oils/lubricants.	CO 3	Apply
7.	Performance test on two stage reciprocating air compressor	CO 4	Apply
8.	Viscosity measurement using redwood Viscometer	CO 4	Apply
9.	Performance test on air conditioning System	CO 5	Apply
10.	Determination of COP of a refrigeration system	CO 5	Apply

Total : 30 Periods

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	3	3										1	3	
CO 2	3	3	3										1	3	
CO 3	3	3	3										1	3	
CO 4	3	3	3										1	3	
CO 5	3	3	3										1	3	
	3	High			2		Medium			1		Low			

Assessment based on Continuous and Final Examination			
Bloom's Level	**Continuous Assessment (60 marks)** **(Attendance – 5 marks)**		**Final Examination** **[40 marks]**
	Rubric based Continuou Assessment **[30 marks]**	**Model Examinatio** **[25 marks]**	
Remember			
Understand			
Apply	100	100	100
Analyze			
Evaluate			
Create			

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Passed in Board of Studies Meeting   Passed in Academic Council Meeting

23ME406	**Manufacturing Technology Laboratory- II**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Nature of Course	Professional Core				
Pre requisites	Manufacturing Technology - I				

Course Objectives

The course is intended to

1. Examine the knowledge on various basic machining operations in special purpose Machines and its applications in real life manufacture of components in the industry.
2. Analyse the objectives and emphasize the importance of manufacturing Sciences in the day-to-day life.
3. Examine the conventional manufacturing processes using lathe and various special purpose machines.
4. Identify the various machine tools and its working principles for various engineering applications.
5. Apply the design of machine tool structures and special features of machine tool design.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Examine the various lathe operations.	Apply
CO 2	Perform the various machining operations in drilling machines.	Apply
CO 3	Choose different machine tools for manufacturing gears.	Apply
CO 4	Utilize different machine tools for surface finishing and tool grinding operations.	Apply
CO 5	Select a suitable process for making key holes.	Apply

S.No	List of Exercises	CO Mapping	Blooms Taxonomy
1	Facing and Step turning in lathe machine.	CO1	Apply
2	Lathe - Taper turning and Thread cutting processes.	CO1	Apply
3	Drilling Machine – Drilling, Reaming processes.	CO2	Apply
4	Drilling Machine – Boring and Tapping processes.	CO2	Apply
5	Contour milling using vertical milling machine.	CO3	Apply
6	Spur and Helical Gear Cutting in milling machine.	CO3	Apply
7	Grinding components using cylindrical and centerless grinding machine.	CO4	Apply
8	Grinding of cutting tools using tool and cutter grinder.	CO4	Apply
9	Machining key hole in a slotting machine.	CO5	Apply
10	Machining slot using a shaping machine.	CO5	Apply
			Total: 60 Periods

Passed in Board of Studies Meeting   Passed in Academic Council Meeting

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	Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	2	1		2				1	1		1	1	3	
CO 2	3	2	1		2				1	1		1	1	3	
CO 3	3	2	1		2				1	1		1	1	3	
CO 4	3	2	1		2				1	1		1	1	3	
CO 5	3	2	1		2				1	1		1	1	3	
	3-High				**2-Medium**				**1-Low**						

Summative Assessment			
Bloom's Level	**Continuous Assessment (60 marks) (Attendance – 5 marks)**		**Final Examinatio [40 marks]**
	Rubric base Continuous Assessment [30 marks]	**Model Examinatio [25 marks]**	
Remember			
Understand	20	20	20
Apply	80	80	80
Analyse			
Evaluate			
Create			