B.E. / B.Tech. Programmes

FIRST YEAR COURSES

CURRICULUM AND SYLLABI

Regulation - 2023

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)

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EXCEL ENGINEERING COLLEGE

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FACULTY OF MECHANICAL ENGINEERING
B.E. SAFETY AND FIRE ENGINEERING
REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM

I SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23MA102	Matrices and Calculus (Common to All Programmes)	BS	3	1	0	4	40	60	100
23EE103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
23SF101	Fundamentals of Fire and Safety Engineering	PC	3	0	0	3	40	60	100
23LET07	Heritage of Tamils (தமிழர்மரபு)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23LEEXX	Language Elective – I	HSS	2	0	2	3	50	50	100
23CH102	Chemistry for Materials Sciences.(Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	BS	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Mandatory Course									
23MC001	Induction Programme	MC	2 Weeks			0	100	-	100
TOTAL			**16**	**2**	**8**	**21**	**470**	**330**	**800**

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
23ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

Passed in Board of studies

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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 Foundations For Engineering	BS	3	2	0	4	40	60	100
23SF201	Basic Civil and Mechanical Engineering	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)									
23LEE02	Language Elective – II	HSS	2	0	2	3	50	50	100
23PH202	Materials Physics	BS	3	2	0	4	50	50	100
23CS203	Problem Solving using Python Programming	ES	3	0	2	4	50	50	100
Practical Course(s)									
23SF202	Safety Engineering Practices Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course									
23MC002	Environmental Sciences	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

III SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23MA301	Transforms and Boundary Value Problems	BS	3	12	0	4	40	60	100
23SF301	Principles of Safety Management	ES	3	0	0	3	40	60	100

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23SF302	Industrial Chemical Technology	PC	3	0	0	3	40	60	100
23SF303	Safety aspects in Manufacturing Processes	PC	3	0	0	3	40	60	100
23UH001	Universal Human Values	HSS	2	1	0	3	100	0	100
Theory with Practical Course(s)									
23SF304	Fluid Mechanics and Fluid Flow Machinery	PC	3	0	2	4	50	50	100
Practical Course(s)									
23SF305	Safety Elements Drawing	PC	0	0	2	1	60	40	100
23SF306	Manufacturing Technology Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course – III Interpersonal Skills	MC	0	0	2	0	100	-	100
TOTAL			**17**	**2**	**8**	**22**	**530**	**370**	**900**

IV SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23MA401	Numerical Analysis and Statistics	BS	3	1	0	4	40	60	100
23SF401	Basic concepts of Fire Engineering	PC	3	0	0	3	40	60	100
23SF402	Environmental Engineering and Management	ES	3	1	0	4	40	60	100
23SF403 / 23ME402	Thermal Engineering	PC	3	0	0	3	40	60	100
23EE41O	Safety in Electrical Systems	ES	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23SF404	Occupational Health and First Aid	PC	3	0	2	4	50	50	100
Practical Course(s)									
23SF405	Thermal Engineering Laboratory	PC	0	0	2	1	60	40	100
23EE411	Safety in Electrical system Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course –IV Soft Skills	MC	2	0	0	0	100	-	100
Total			**20**	**2**	**6**	**23**	**470**	**430**	**900**

V SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									

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23SF501	Design of Fire Protection Systems	PC	3	2	0	4	40	60	100
23SF502	Quality Control and Reliability Engineering	PC	3	2	0	4	40	60	100
23SF503	Chemical Process Safety	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)									
23SF504	Safety in Construction	PC	3	0	2	4	50	50	100
Practical Course(s)									
23SF505	Fire safety Engineering Laboratory	PC	0	0	2	1	60	40	100
23SF506	Chemical Engineering Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course -V	MC	2	0	0	0	100	-	100
TOTAL			**20**	**4**	**6**	**23**	**370**	**430**	**800**

VI SEMESTER

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23SF601	Process Instrumentation and Control	PC	3	2	0	4	40	60	100
23SF602	Hazard Control In Manufacturing	PC	3	2	0	4	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
Theory with Practical Course(s)									
23SF603	Legal aspects of Safety	PC	3	0	2	4	50	50	100
Practical Course(s)									
20SF604	Environmental Laboratory	PC	0	0	4	2	60	40	100
23SF605	Design Thinking &Mini Project	EEC	1	0	2	2	40	60	100
20SF606	Internship	EEC	Two Weeks			1	100	0	100
Total			**16**	**4**	**8**	**23**	**410**	**390**	**800**

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VII SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23SF701	Hazard Identification and risk Management	PC	3	0	0	3	40	60	100
23SF702	Transportation system and safety	PC	3	0	0	3	40	60	100
23SFEXX	Professional Elective – III	PE	3	0	0	3	40	60	100
23SFEXX	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)									
23SF703	Fire Engineering Laboratory	PC	0	0	4	2	60	40	100
23SF704	Design Project	EEC	0	0	2	1	40	60	100
TOTAL			**15**	**0**	**6**	**18**	**300**	**400**	**700**

VIII SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23SFEXX	Professional Elective - V	PE	3	0	0	3	40	60	100
23SFEXX	Professional Elective – VI	PE	3	0	0	3	40	60	100
23SF801	Major Project	EEC	0	0	16	8	40	60	100
Total			**6**	**0**	**16**	**14**	**120**	**180**	**300**

MANDATORY COURSES (MC)									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23MC101	Induction Programme	MC	2 Weeks			0	100	-	100
23MC102	Environmental Sciences	MC	2	0	0	0	100	-	100
23MC103	Soft Skills	MC	2	0	0	0	100	-	100
23MC104	Indian Constitution	MC	2	0	0	0	100	-	100

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23MC105	Yoga and Values for Holistic Development	MC	2	0	0	0	100	-	100

PROFESSIONAL ELECTIVES (PE)

Stream – I Industrial Safety Engineering

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23SFE01	Industrial Noise and Vibration Control	PE	3	0	0	3	40	60	100
23SFE02	Introductory Design of Structures	PE	3	0	0	3	40	60	100
23SFE03	Computational Fluid Dynamics	PE	3	0	0	3	40	60	100
23SFE04	Plant Layout and Materials Handling	PE	3	0	0	3	40	60	100
23SFE05	Work Study and Ergonomics	PE	3	0	0	3	40	60	100
23SFE06	Human Factors in Engineering	PE	3	0	0	3	40	60	100
23SFE07	Power Plant Engineering	PE	3	0	0	3	40	60	100
23SFE08	Industrial Ecology	PE	3	0	0	3	40	60	100
23SFE09	Principles of Industrial Management	PE	3	0	0	3	40	60	100
23SFE10	Industrial Safety	PE	3	0	0	3	40	60	100

Stream – II Safety Engineering

23SFE21	Fluid Power Safety	PE	3	0	0	3	40	60	100
23SFE22	Safety in Health Care-Waste Management	PE	3	0	0	3	40	60	100
23SFE23	Safety in Petroleum and Petrochemical Industries	PE	3	0	0	3	40	60	100
23SFE24	Advanced Safety Engineering and Management	PE	3	0	0	3	40	60	100
23SFE25	Maintenance Engineering	PE	3	0	0	3	40	60	100
23SFE26	Safety in Mines	PE	3	0	0	3	40	60	100
23SFE27	Safety in Textile Industry	PE	3	0	0	3	40	60	100
23SFE28	Safety Audit	PE	3	0	0	3	40	60	100
23SFE29	Safety in Engineering Industry	PE	3	0	0	3	40	60	100
23SFE30	Legal Aspects of HSE	PE	3	0	0	3	40	60	100
23SFE31	Safety in Bio Engineering	PE	3	0	0	3	40	60	100
23SFE32	Dock Safety	PE	3	0	0	3	40	60	100

Stream – III Fire Engineering

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23SFE41	Fire Engineering and Explosives	PE	3	0	0	3	40	60	100
23SFE42	Fire Dynamics	PE	3	0	0	3	40	60	100
23SFE43	Life Safety In Building Fire	PE	3	0	0	3	40	60	100
23SFE44	Design of Fire Fighting and Protection Systems	PE	3	0	0	3	40	60	100
23SFE45	Fire Risk Calculations	PE	3	0	0	3	40	60	100
23SFE46	Fire and Arson Investigation	PE	3	0	0	3	40	60	100
23SFE47	Automobile Engineering and Safety	PE	3	0	0	3	40	60	100
23SFE48	Fireworks Safety	PE	3	0	0	3	40	60	100
23SFE49	Plant Fire Safety	PE	3	0	0	3	40	60	100
23SFE50	Fire Engineering and Protection	PE	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (For Other Branches)

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23SFO01	Food and Bio-safety	OE	3	0	0	3	40	60	100
23SFO02	Disaster management	OE	3	0	0	3	40	60	100
23SFO03	Personality Management	OE	3	0	0	3	40	60	100
23SFO04	First Aid and Emergency Procedures	OE	3	0	0	3	40	60	100
23SFO05	Entrepreneurship Development	OE	3	0	0	3	40	60	100
23SFO06	Industrial Safety and Environment Acts	OE	3	0	0	3	40	60	100
23SFO07	Artificial Intelligent and Expert Systems	OE	3	0	0	3	40	60	100

ONECREDIT COURSES

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23SFA01	Intellectual Property Rights	EEC	1	0	0	1	100	0	100
23SFA02	Statistical Methods for Engineers	EEC	1	0	0	1	100	0	100
23SFA03	Factories Act	EEC	1	0	0	1	100	0	100
23SFA04	CNC Programming	EEC	1	0	0	1	100	0	100
23SFA05	Fire Extinguisher	EEC	1	0	0	1	100	0	100

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23MEA01	Lean Manufacturing	EEC	1	0	0	1	100	0	
23MEA03	Plastics - Processing Tooling Assembly and Testing	EEC	1	0	0	1	100	0	

SUMMARY

S. No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDITS (AICTE)	CREDIT in %
		I	II	III	IV	V	VI	VII	VIII		
1.	HSS	4	4	0	3					11 (10-14)	
2.	BS	8	8	4	4					24 (22-28)	
3.	ES	6	9	3	7					25 (24)	
4.	PC	3		12	12	17	14	8		66 (48)	
5.	PE					3	3	6	6	18 (18)	
6.	OE					3	3	3		9	
7.	EEC						3	1	8	12 (12-16)	
8.	MC	0	0	0	0	0				0	
Total		21	21	22	23	23	23	18	14	165	

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

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REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
FIRST YEAR COURSES CURRICULUM AND SYLLABI

I SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23PH102	Physics for computing sciences	BS	3	0	2	4	50	50	100
23MA102	Matrices and Calculus	BS	3	1	0	4	40	60	100
23CH101	Chemistry for Electrical Sciences	BS	3	0	2	4	50	50	100
23CH102	Chemistry for Material Sciences	BS	3	0	2	4	50	50	100
23ENE01	Communicative English	BS	2	0	2	3	50	50	100

Language Electives									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
20LEJ06	Japanese	HSS	2	0	2	3	50	50	100
23LET07	Tamilar Marabu (தமிழர் மரபு)	HSS	1	0	0	1	100	0	100

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Passed in Board of Studies Meeting on 17.03.23

Approved in Academic Council Meeting on 27.04.23

23PH102	PHYSICS FOR COMPUTING SCIENCES (Common to AI&DS, CSE, CSBS and IT courses)	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 in production of laser and their applications in engineering and medical field
2. Know the types of fibre optics and their applications in advanced communication systems.
3. Relate the concept of ultrasonics in the field of engineering and medical
4. Distinguish the types of semiconductors and its applications.
5. Learn the optoelectronic devices like solar cell, LED etc.

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.	Apply
CO 2	Discuss the importance of different fibre optic communication systems.	Understand
CO 3	Describe the production and applications of ultrasonics.	Understand
CO 4	Explain the various properties of semiconductor and its types.	Understand
CO 5	Demonstrate the construction and working of the optoelectronic devices	Apply

Course Contents

Module – I LASER PHYSICS 9

Lasers: Introduction - characteristics of laser - population of energy levels - Einstein's A and B coefficients – Types of lasers – CO_2 and semiconductor lasers (homojunction and heterojunction) - Industrial Applications – Laser heat treatment (cutting, welding and drilling) – Holography.

Module – II FIBER OPTICS 9

Fiber Optics: Introduction – principle and propagation of light in optical fiber - Numerical aperture and Acceptance angle - Types of optical fiber (Material, refractive index & mode) - Double crucible technique – splicing, loss in optical fibre – optical fiber communication system - applications - fiber optic sensors – temperature and displacement sensors - fiber optic endoscope.

Module – III ULTRASONICS 9

Introduction – Production – magnetostriction effect – magnetostriction generator - piezoelectric effect – piezoelectric generator – detection of ultrasonic waves properties – Cavitations – velocity measurement – acoustic grating – Industrial applications – SONAR – Non destructive testing – Sonograms.

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

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Module – IV SEMICONDUCTOR PHYSICS 9

Introduction – properties – types - Intrinsic Semiconductors – direct and indirect band gap semiconductors — carrier concentration of intrinsic semiconductors- extrinsic semiconductors - N-type - P-type semiconductors (Qualitative) — Hall effect – theory – experimental and its applications.

Module – V OPTO ELECTRONIC DEVICES 9

Classification of optical materials – carriers generation and recombination processes – photo current in a P- N diode: principle and working – solar cell and photo detectors: principle and working – LED: principle and working – Organic LED. principle and working, advantages over LED.

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of wavelength of the given Laser beam.	CO 1	Apply
2	Particle size determination of the given particles using laser.	CO 1	Apply
3	Determination of acceptance angle using optical fiber.	CO 2	Apply
4	Determination of velocity of sound and compressibility of liquid - Ultrasonic interferometer.	CO 3	Apply
5	Determination of band gap of a semiconductor	CO 4	Apply
6	Determination of V-I characteristics of solar cell.	CO 5	Apply

Total: 30 Periods

Text Books

1. R Murugeshan&KiruthigaSivaprasath, "Modern Physics",S.Chandand company. Ltd., New Delhi, 18th edition, 2019.
2. M.N. Avadhanulu&Kshirsagar PG. "A Text book of Engineering Physics", S.Chand and Company. Ltd., New Delhi, 11th edition, 2019.
3. Dr. P.K. Diwan, "Applied Physics for Engineers", Wiley India PVT Ltd,1st edition, 2014.

Reference Books

1. Halliday, D, Resnick, R and Walker, J, "Principles of Physics",Wiley, 11th edition,2020.
2. Ghatak A K and Thyagarajan K, "Introduction to Fiber Optics", Cambridge University Press, 2017
3. Serway, R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning, 9th edition, 2019.

Additional References

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7694722/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6afMRx
4. https://nptel.ac.in/courses/115/105/115105099/#
5. https://www.youtube.com/watch?v=uv0LxMoalEQ

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

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								1			
CO 2	3	2	1								1			
CO 3	3	2	1								1			
CO 4	3	2	1								1			
CO 5	3	1	1								1			
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50]
	Theory				Practicals	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	12	12	12			30
Understand	34	38	28		40	60
Apply	4	-	10		60	10
Analyze	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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Passed in Board of Studies Meeting 17.03.23

Passed in Academic Council Meeting 27.04.23

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.

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

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Module – IV **MULTIPLE INTEGRALS** 9+3

Double integrals – Change of order of integrations- Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids.

Module – V **VECTOR CALCULUS** 9+3

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification andapplicationinevaluatingline, surfaceandvolumeintegrals (cube, rectangular parallelepiped)

Total : 60 Periods

Text Books

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

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company. 1st Edition, 2018
2. N.P.Bali, 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

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	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					

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Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
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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23CH101	CHEMISTRY FOR ELECTRICAL SCIENCES (Common to BME, ECE and EEE courses)	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 fundamentals and classifications of batteries.
4. Develop the understanding and applications of basic concepts of electrochemistry.
5. Understand the causes and control measures of corrosion

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	Discuss the basic principles and mechanism of working of batteries and fuel cells.	Understand
CO 4	Illustrate the principles of electro chemical cells. EMF, electroplating and electrolysis.	Understand
CO 5	Demonstrate the importance of protection of metals from corrosion.	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 and pHvalue. 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.

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Module – III ELECTROCHEMISTRY 9

Electrode potential, Nernst equation and problems, Reference electrodes, Standard hydrogen electrode, Calomel electrode, Ion selective electrode, Measurement of pH by glass electrode, Electro chemical series, Electro chemical cell, Galvanic cell: measurement of EMF.

Module – IV ENERGY STORAGE DEVICES 9

Batteries: Definition, characteristics and classification. Primary battery: Alkaline battery, Secondary battery: lead acid battery, lithium-ion and lithium phosphate battery, Fuel cells: construction and working of H_2-O_2 fuel cell.

Module – V 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.

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. A Textbook of Engineering Chemistry by Ushamani M George KE, Rani Joseph,2021.
3. Dr.Sunita Rattan. Publisher, S K. Kataria & Sons. Reprint 2020.

Reference Books

1. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
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. Monica Jain P. C. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 17th Edition, 2019

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=jFQeDef6bug

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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
CO 1	3	2			3						1			
CO 2	3	2			3						1			
CO 3	3	2			3						1			
CO 4	3	2			3						1			
CO 5	3	1			3						1			
	3-High				2-Medium				1-Low					

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

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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. Kataria& 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

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

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23ENE01	COMMUNICATIVE ENGLISH Common to all B.E./B.Tech Programmes	L	T	P	C
		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 Telephonic 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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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.elllo.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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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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23LET07 **தமிழர் மரபு** LTPC 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 – சிற்பக் கலை:** 3

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 தாலரங்களும், 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. (விகடன் 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

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. (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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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. SAFETY AND FIRE ENGINEERING
REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
I TO II SEMESTERS CURRICULUM

I SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23MA102	Matrices and Calculus (Common to All Programmes)	BS	3	1	0	4	40	60	100
23EE103	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100
23SF101	Fundamentals of Fire and Safety Engineering	PC	3	0	0	3	40	60	100
23LET07	Heritage of Tamils (தமிழர்மரபு)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23LEEXX	Language Elective – I	HSS	2	0	2	3	50	50	100
23CH102	Chemistry for Material Sciences.(Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	BS	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Mandatory Course									
23MC101	Induction Programme	MC	2 Weeks			0	100	-	100
TOTAL			**16**	**2**	**8**	**21**	**470**	**330**	**800**

Language Electives – I									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23LEE01	Communicative English	HSS	2	0	2	3	50	50	100
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

Passed in Board of studies
29.03.2023
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Approved in Academic Council
27.04.2023

I Semester

23SF101	Fundamentals of Fire and Safety Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Provide in-depth view of fire/combustion science
2. Introduce the concepts of fire protection/
3. Brief suppression engineering principles and systems currently followed in Oil & Gas industrial sector
4. Learn the legislation requirements-national/international codes
5. Know standards from fire & safety perspective

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the causations and extinguishment of different kinds of fire	Understand
CO2	Compare the different stages of fire, harmful products-health effects & behavior	Understand
CO3	Demonstrate the usage of various fire extinguishers	Understand
CO4	Identify different types of active fire protection and Passive systems installations.	Apply
CO5	Illustrate the various workplaces safety.	Understand

Course Contents:

Module - I **Introduction** 9

Fire, Classifications of fires, temperature, heat, specific heat, Fire Causation theories, Theory of Fire extinguishment, Liquids and Gases: flash point, fire point, ignition, combustion; Ignition- pilot ignition, spontaneous ignition, ignition sources; Types of combustion-rapid, spontaneous, explosion; Diffusion flames-zones of combustion, smoldering combustion, characteristics of diffusion flame; Premixed flames- Do's and Don't's at Fire Hazard.

Module - II **Development of Fire Dynamics** 9

Incipient, smoldering, flame and heat stages; Products of combustion-flame, heat, smoke, fire gases; Smoke – constituents of smoke, quantity and rate of production of smoke, quality of smoke, smoke density, visibility in smoke; Toxicity of smoke- effect of harmful agents preventing escape and causing injury or death - CO, CO2, HCN, SO2, NH3, Nitrogen oxide. Effect of heat exposure to human body, body burns.

Module - III **Fire Suppression Systems** 9

Introduction, Definitions, Water as an extinguishing agent, Basic Components of a Fire Protection system, Fire water supply systems-Types, Design philosophy acc.to OISD, Foam, DCP & other gaseous extinguishing agents.

Passed in Board of Studies Meeting on 28.03.2023 *Approved in Academic Council Meeting on 27.04.2023*

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Module - IV **Active and Passive Fire Protection System** 9

Classification of fire protection systems-Active & Passive: Active FPS. Types:- Fire Extinguishers, Fire hydrants, Sprinklers. Installation & maintenance as per relevant national and international standards (IS, OISD, NFPA etc). Passive FPS- Fire Proofing: Introduction, materials used in coatings & paintings, concrete as a fire proofing material; Exit & Egress Arrangements: Basic definitions- Exit, Means of Egress system, Exit door, Refuge area, Safe area & other related as per NFPA codes &NBC

Module - V **Safety at Work** 9

Definition – Classification of Safety at Work, Safety Foundations- Policy, responsibilities – employers and employees, safety culture, risk assessment and control. Monitoring, Review and Safety audit. Hazard Control – Movement, Mechanical, Manual, Equipment, Electrical, Fire, Chemical, Biological, Physical and Psychological controls.

Total: 45 Periods

Text Books:

1. A.K. Das, "Principles of Fire Safety Engineering and Management-(Understanding Fire & Fire Protection)",First edition,20177
2. R.S. Gupta, "Handbook of Fire Technology,2015.
3. "Fire Safety Management Handbook" Third Edition By Daniel E Della Giustina 2018.

Reference Books:

1. Jain V.K. (2010). "Fire safety in buildings" (2nd edn.). New Age International (P) Ltd., New Delhi.
2. Barendra Mohan Sen (2013). "Fire protection and prevention the essential handbook", UBS publishers and Dist., New Delhi.
3. Gupta, R.S.(2010). "A Hand book of fire technology" (2nd edn.). Universities Press.

Additional References:

1. https://www.academia.edu/34210590/Fire_Safety_Management_Handbook_Third_Edition
2. https://www.iitk.ac.in/nicee/IITK-GSDMA/F05.pdf

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					2					3	3	2	
CO2	3	2					2					3	3	2	
CO3	3	2					2					3	3	2	
CO4	3	2					2					3	3	2	
CO5	3	2					2					3	3	2	
	3 - High					2 - Medium						1 - Low			

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

Passed in Board of Studies Meeting on 28.03.2023 *Approved in Academic Council Meeting on 27.04.2023*

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Bloom's Category	Summative Assessment			
	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				

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+1

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction 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.

Passed in Board of Studies Meeting on 28.03.2023 *Approved in Academic Council Meeting on 27.04.2023*

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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

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						

Passed in Board of Studies Meeting on 28.03.2023 *Approved in Academic Council Meeting on 27.04.2023*

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23PH201	SOLID STATE PHYSICS (Common to BME, ECE and EEE)	L	T	P	C
		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. Classify the types of fiber optics and their applications in advanced communication systems.
3. Understand on the concept and properties of matter like elasticity and its applications.
4. Learn the electronic properties of semiconductors and its applications.
5. Acquire the knowledge of dielectric and magnetic materials properties.

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	Realize the importance of different fibre optic communication systems.	Understand
CO 3	Study the elastic behaviour and working of torsional pendulum.	Understand
CO 4	Differentiate the types of semiconductor materials and its applications.	Apply
CO 5	Solve the dielectric constant, susceptibility and losses.	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	**FIBER OPTICS**	**9**
Fiber Optics: Introduction – features of optical fiber- principle, numerical aperture and acceptance angle - types of optical fibers - fabrication of optical fiber–applications - optical fiber communication system - fiber optic sensors – temperature and displacement sensors - fiber optic endoscope.		
Module – III	**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 – IV	SEMICONDUCTOR PHYSICS	9
Introduction – properties – types - Intrinsic Semiconductors – energy band diagram – direct and indirect band gap semiconductors - carrier concentration of intrinsic semiconductors- extrinsic semiconductors (Qualitative) - N-type - P-type semiconductors –Hall effect – theory – experimental and its applications.		
Module – V	**DIELECTRIC AND MAGNETIC MATERIALS**	**9**
Dielectric materials - Electronic, Ionic, Orientational and space charge polarization – dielectric constant- dielectric loss –classification of insulating materials and their applications - Introduction to magnetic materials - Soft and Hard magnetic materials – Ferromagnetic materials – Anti-ferromagnetic materials – Ferrites.		
		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.	CO2	Apply
3	Determination of the rigidity modulus of a given wire using Torsion pendulum.	CO3	Apply
4	Determination of Young's modulus of a material by non-uniform bending method.	CO3	Apply
5	Determination of Young's modulus of a material by uniform bending method.	CO3	Apply
6	Determination of the band gap of a given semiconductor.	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. William D.Callister,Jr and David. G.Bethwisch, "Materials Science and Engineering", John Wiley & Sons, Inc,9th edition, 2019.

Reference Books

1. Halliday, D, Resnick, R and Walker, J, "Principles of Physics", Wiley, 10th edition, 2014.
2. Serway, R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning, 9th edition, 2019.
3. Raghavan, V. "Materials Science and Engineering, A First course", PHI Learning, 5th edition, 2015.

Web References:

1. https://nptel.ac.in/courses/115/107/115107095/
2. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6aMRx
3. https://nptel.ac.in/courses/115/105/115105099/#
4. https://www.youtube.com/watch?v=uv0LxMoaIEQ

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	2	1											
CO 2	3	1	1											
CO 3	3	2	1											
CO 4	3	1	1											
CO 5	3		1											
	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	12	12	12			30
Understand	34	34	28		40	60
Apply	4	4	4		60	4
Analyse			6			6
Evaluate						
Create						

Passed in Board of Studies Meeting on 28.12.2023 Passed in Academic Council Meeting on 11.01.2024

CHAIRMAN - BOARD OF STUDIES

23PH202	MATERIALS PHYSICS (Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	L	T	P	C
		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 coefficients.
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 – inter-planar 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

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						

23CH201	CHEMISTRY FOR COMPUTING SCIENCES (Common for IT, CSE, CSBS and AIDS)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Chemistry				

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. Develop the understanding and applications of basic concepts of electrochemistry
4. Understand the fundamentals of batteries.
5. Conversant with the basics of polymers and engineering plastics.

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.	Understand
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials.	Understand
CO 3	Use the principles of electrochemical cells, EMF, electroplating and electrolysis.	Understand
CO 4	Discuss the basic principles and mechanism of working of batteries and fuel cells.	Apply
CO 5	Classify engineering plastics and some important industrial polymers.	Understand

Course Contents

Module – I	WATER ANALYSIS AND WATER TREATMENT	9
Water analysis: Sources of water, hard water and soft water, Hardness of water-problems, Water treatment: Definition, Conditioning methods: Internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization), Desalination, Reverse osmosis (RO), Municipal water treatment.		
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, laser ablation. Applications of nanomaterials in medicine, agriculture, energy, electronics, information technology and catalysis.		
Module – III	**ELECTROCHEMISTRY**	**9**
Electrode potential, Nernst equation and problems, Reference electrodes, Standard hydrogen electrode, Calomel electrode, Ion selective electrode-glass electrode, Electrochemical series, Electrochemical cell, Galvanic cell-Daniel cell.		

Module – IV	ENERGY STORAGE DEVICES	9
Batteries: Definition, characteristics and classification, Primary battery: Alkaline battery, Secondary battery: lead acid battery, and lithium-ion battery, Fuel cells: construction and working of H_2-O_2 fuel cell.		
Module – V	**POLYMERIC MATERIALS**	**9**
Engineering plastics: Thermosetting and Thermoplastics, Polymers: polyethylene (PE), polyvinylchloride, nylon-6:6, Fabrication: Injection molding, Composites: definition, types, polymer matrix composites, Biodegradable polymers		
		Total : 45 Periods

Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Determination of hardness of water by using EDTA method.	CO1	Apply
2	Determination of chloride content in water sample.	CO1	Apply
3	Conductometric titration of strong acid versus strong base.	CO2	Apply
4	Determination of strength of HCl by pH metry.	CO2	Apply
5	Estimation of copper in brass by EDTA method.	CO3	Apply
6	Determination of rate of corrosion by weight loss method	CO3	Apply
7	Estimation of strength of iron by potentiometric titration	CO3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	CO3	Apply

Text Books

1. O.G.Palanna, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi.2020.
2. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
3. M.Manjuladevi and G.Pradheesh, Chemistry Labortory Manual, Gem Publishers, 2017
4. S. S. Dara, "A Text Book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

Reference Books

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2021.
2. R. Sivakumar and N. Sivakumar, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd. New Delhi. 2019.
3. Dr.Sivanesan and Nandagopal, "Engineering Chemistry-I" V. K. Pub. Pvt. Ltd. 2019.
4. P.C.Jain and Monicka Jain, "Engineering Chemistry", Dhanapat Rai Publising Company Pvt. Ltd. 2017.
5. Text book of Polymers science by Gowarikar and Vishwanathan, New Age International Publishers, New Delhi, 2nd Edition, 2015.

Web 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=jFQeDef6bug

Passed in Board of Studies Meeting on 28.12.2023 *Passed in Academic Council Meeting on 11.01.2024*

CHAIRMAN - BOARD OF STUDIES

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	2									1			
CO 2	3	2									1			
CO 3	3	2									1			
CO 4	3	2									1			
CO 5	3	2									1			
	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	20	20	10		30	30
Understand	30	30	15		30	60
Apply			25		40	10
Analyse						
Evaluate						
Create						

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

	Pos												PSOs		
COs	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	15
Understand	Tutorial Class /Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Exam			Final Examination (60)
	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				

23LEE02	ADVANCED COMMUNICATIVE ENGLISH (Common to all B.E. / B.Tech Programme)	L	T	P	C
		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.		

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.

Web References:

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

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									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					

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	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

23LEJ06	JAPANESE	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Read & Write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Express day to day conversation and describe their ability to share their experiences	Understand

Course Contents

Module – I		9
INTRODUCTION- はじめまして – ALPHABET - Hiragana - NUMBERS- すうじ- Classroom Words- きょうしつのことば – LISTENING		
Module – II		**9**
ALPHABET-Katakana - BASIC SENTENCE- じぶんのなまえ - COUNTRY NAMES- くにのなまえ- SAYING AGE- なんさいですか - LISTENING		
Module – III		**9**
SAYING MONTH- なにつき - SAYING BIRTHDAY- たんじょうび - KAZOKU- かぞく - KNOWINGTHINGS- あ/こ/そ – LISTENING		

Module – IV		**9**
PRONOUNS - ADJECTIVES - SAYING TIME, SHOPPING – LISTENING		
Module – V		**9**
SELF INTRODUCTION - MY TOWN - Watashino machi - GO, COME, RETURN - BASIC VERBS – TRANSPORT – LISTENING		
		Total : 45 Periods

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

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	50				4	10
Understand		20	20		8	20
Apply		30	30		8	20
Analyse						
Evaluate						
Create						

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

23MC202	ENVIRONMENTAL SCIENCES (Common for all branches)	L	T	P	C
		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.		

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					

Summative Assessment					
Bloom's Level	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					

23MC203	INTERPERSONAL SKILLS (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory – Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Evaluate current relationships and their communication style.
2. Identify ways for improving important relationships.
3. Explore how the Bible correlates with principles from the chapter.
4. Describe how the communication processes impacts our ability to effectively communicate.
5. Identify challenges that may arise from interpersonal communication.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Practice interpersonal communication skills to influence and build good relationships.	Remember
CO 2	Identify and pursue personal learning goals.	Understand
CO 3	Give evident feedback.	Apply
CO 4	Reveal group dynamics and amiable behaviour.	Apply
CO 5	Emphasis the communication process.	Understand

Course Contents

Module – I	**FUNDAMENTALS OF INTERPERSONAL COMMUICATION**	**6**
Facts of communication and Interpersonal communication - culture and gender - Communication and Self disclosure - Presentation of Interpersonal perception - Learning goals - Feeling and feedback.		
Module – II	**INTERPERSONAL COMMUNICATION IN ACTION**	6
Nature of language - language and culture - usage and abuse of language -Positive communication -Non verbal communication - Listening strategies - Barriers of listening.		
Module – III	**EMOTIONAL INTELLIGENCE**	6
Influence of emotional experience and expressions - Accepting the responsibilities and changes - Negotiation tactics - Dealing with criticism and appreciation - Collaborative Problem Solving - Resilience Building.		
Module – IV	**TRANSACTIONS**	6
Different types of transactions - Building Positive Relationship - Managing Conflict - Connecting across Difference -Factors hampering Interpersonal interactions - Assertiveness in communication.		

Module – V	**ESSENTIAL INTERPERSONAL COMPETENCIES**	6
Behaviour - understanding limiting behaviour - Interpersonal and small and lateral thinking-Win -Win attitude - Positive thinking - Stress feedback - Personal Evaluation of Interpersonal Relationship Skills group behavior - Critical management - Assertive		
		Total : 30 Periods

Text Books

1. Bozeman, Jeanine C and Argile Smith, “Interpersonal Relationship Skills for Ministers” Gretna, LA: Pelican Publishing Company, 1st Edition, 2004.
2. Floyd, Kory, “Interpersonal Communication”, 2d. Boston: Mccraw-Hill, 2nd Edition, 2011.

Reference Books

1. Augsburger, David, “Caring Enough to Confront How to Understand and Express Your Deepest Feelings Towards Others”, updated ed Ventura, CA: Regal Books, 2nd Edition 2009.
2. Vohs, Kathleen D., and Eli J., Finkel, eds, “Self and Relationships: Connecting Intrapersonal and interpersonal Processes”. New York Guilford Press, 1st Edition, 2006.

Web References:

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

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Presentation of Interpersonal perception	1	Remember
2	Non-Verbal Communication	2	Understand
3	Negotiation tactics	3	Apply
4	Managing Conflict	4	Apply
5	Stress Management	5	Understand

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	2	1	2	
CO 2										3	2	1	2	
CO 3										3	2	1	2	
CO 4										3	2	1	2	
CO 5										3	2	1	2	
	3-High				**2-Medium**				**1-Low**					

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment 1 (50 Marks)	**Assessment 2 (50 Marks)**
Remember	20	20
Understand	10	10
Apply	20	20
Analyse		
Evaluate		
Create		

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. SAFETY AND FIRE ENGINEERING
REGULATION – 2023
CHOICE BASED CREDIT SYSTEM
II SEMESTER CURRICULUM AND SYLLABI

II SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23MA202	Differential Equations, complex variables and Transforms (Common to All Programmes)	BS	3	2	0	4	40	60	100
23SF201	Basic Civil and Mechanical Engineering	ES	3	1	0	4	40	60	100
23HS202	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	Physics of Materials (Common to Aero, Agri, Civil, FT, Mech, PCT & SF)	BS	3	0	2	4	50	50	100
23CS201	Problem Solving using Python	ES	3	0	2	4	50	50	100
Practical Course(s)									
23SF202	Safety 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	3	8	21	490	310	800

CHAIRMAN-BOARD OF STUDIES

Passed in Board of Studies Meeting on 18.12.2023

Approved in Academic Council 11.01.2024

Language Electives – II									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23ENE03	Hindi	HSS	2	0	2	3	50	50	100
23ENE04	French	HSS	2	0	2	3	50	50	100
23ENE05	German	HSS	2	0	2	3	50	50	100
23ENE06	Japanese	HSS	2	0	2	3	50	50	100

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II SEMESTER

23SF201	Basic Civil and Mechanical Engineering	L	T	P	C
		3	1	0	4
Nature of Course	Professional Core				
Pre requisites	NIL				

Course Objectives

The course is intended to

1. Impart basic knowledge on Civil and Mechanical Engineering
2. Familiarize the materials and measurements used in Civil Engineering
3. Provide the exposure on the fundamental elements of civil engineering structures.
4. Enable the students to distinguish the components and working principle of power plant units and IC Engines.
5. Explain the concept of Refrigeration & Air-conditioning system.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Know the profession of Civil and Mechanical engineering.	Understand
CO2.	Explain the usage of construction material and proper selection of construction materials.	Apply
CO3.	Summarize the component of building with their function	Understand
CO4.	Identify the components used in power plant cycle and demonstrateworking principles of petrol and diesel engine	Understand
CO5.	Elaborate the components of refrigeration and Air conditioning cycle.	Understand

Course Contents:

MODULE-I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 9

Overview of Civil Engineering – Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering. Overview of Mechanical Engineering – Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering.

MODULE-II SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours – examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel – timber – modern materials

MODULE-III BUILDING COMPONENTS AND STRUCTURES 9

Foundations: Types of foundations – Bearing capacity and settlement – Requirement of good foundations. Civil Engineering Structures: Brick masonry – stonemasonry – beams – columns – lintels – roofing– flooring –plastering – floor area, carpet area and floor space index.

CHAIRMAN-BOARD OF STUDIES

MODULE-IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 9

Internal combustion engines: Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Power Plants: Working principle of steam, Gas, Diesel, Hydro – electric and Nuclear Power plants

MODULE-V REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

Total: 45 Periods

Text Books:

1. Shanmugam G and Palanichamy MS,"Basic Civil and Mechanical Engineering", Tata McGraw Hill PublishingCo. NewDelhi, 1996.

Reference Books:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S.,"Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Seetharaman S.,"BasicCivil Engineering",AnuradhaAgencies,2005.
4. ShanthaKumar SRJ.,"Basic Mechanical Engineering", Hitech Publications, Mayiladuthurai, 2000.
5. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", Anuradha Publishers,Kumbakonam,2000.

Additional References:

1. https://archive.nptel.ac.in/courses/105/106/105106201/introduction to civil engineering
2. https://www.academia.edu/31536667/Mechanical-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	2						1	2	1	2		2			
CO2	2						1	2	1	2		2			
CO3	2						1	2	2	2		2			
CO4	2						1	2	1	2		2			
CO5	2						1	2	1	2		2			
	3	High				2	Medium					1	Low		

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

CHAIRMAN-BOARD OF STUDIES

Passed in Board of Studies Meeting on 18.12.2023 *Approved in Academic Council 11.01.2024*

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	30	30	30	60
Apply	10	10	10	20
Analyze	---	---	---	---
Evaluate	---	---	---	---
Create	---	---	---	---

CHAIRMAN-BOARD OF STUDIES

23SF202	Safety Engineering Practices Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Engineering Sciences				
Pre requisites	Fundamentals of Science				

Course Objectives

The course is intended

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

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Construct green sand mould in foundry	Apply
CO 2	Experiment with arc welding equipments to join the structures	Apply
CO 3	Make the models using sheet metal	Apply
CO 4	Fabricate joints in carpentry components	Apply
CO 5	Carry out basic machining operations and pipe connections including plumbing works	Apply

List of Exercises

S.No	Exercises	CO Mapping	RBT LEVEL
Foundry			
1	Preparation of green sand mould	CO 1	Apply
Welding			
2	Lap joint using Arc welding	CO 2	Apply
3	Butt joint using Arc welding	CO 2	Apply
4	Tee joint using Arc welding	CO 2	Apply
Sheet metal			
5	Fabrication of tray using sheet metal	CO 3	Apply
6	Fabrication of cone using sheet metal	CO 3	Apply
Carpentry			
7	Cross lap joint using wood	CO 4	Apply
8	Tee lap joint using wood	CO 4	Apply
9	Dove-tail joint using wood	CO 4	Apply
Special Machines			
10	Drilling of hole in the given work piece	CO 5	Apply
Plumbing			
11	External thread cutting	CO 5	Apply
12	Domestic water pipe line connection	CO 5	Apply
13	Fire Extinguisher (Operation of ABC Type)	CO 5	Apply

Passed in Board of Studies Meeting on 18.12.2023

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council 11.01.2024

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		
CO2			3									2	2		
CO3			3									2	2		
CO4			3									2	2		
CO5			3									2	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	—	—	—

CHAIRMAN-BOARD OF STUDIES

Passed in Board of Studies Meeting on 18.12.2023

Approved in Academic Council 11.01.2024

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, 2π) and period ($-\pi$, π) – 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	One dimensional wave equation	3	Apply
6	One dimensional heat equation	3	Apply
7	Fourier Transform	4	Apply
8	Inverse Fourier Transform	4	Apply
9	Z - Transform	5	Apply
10	Inverse Z - Transform	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		

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory			**Practical**		
	IAE I (5)	**IAE II (10)**	**IAE III (10)**	**Attendance [5]**	**Rubric based C/A [20]**	
Remember	10	10	10		-	10
Understand	10	10	10		40	30
Apply	30	30	30		60	60
Analyze	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

23MA302	PROBABILITY AND STATISTICS (Common to AIDS, BME, CSBS, CSE, IT & M.TECH. CSE)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundation of Mathematics				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of random variables.
2. Acquire essential knowledge of random variables necessary for subsequent studies in digital communication.
3. Develop an understanding of hypothesis testing for both small and large samples.
4. Familiarize students with the basic concepts of experimental design types used in engineering.
5. Study classification types and principles of statistical quality control.
6. Utilize statistical methods to analyze data, infer patterns, and make informed decisions.

Course Outcomes

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

CO.No.	Course Outcome	Bloom's Level
CO1	Construct the concepts of a random variables and Probability distributions.	Apply
CO2	Examine the functions of multiples random variable.	Apply
CO3	Implement hypothesis testing techniques for small and large samples.	Apply
CO4	Predict the design of experiments in the field of engineering by the concept of classification..	Apply
CO5	Identify the sampling distribution and statistical techniques	Apply
CO6	Utilize data infer patterns and mastery in statistical reasoning and application.	Apply

Course Contents:

MODULE – I	UNIVARIATE RANDOM VARIABLES	9
Random Variables – Discrete & Continuous random variables – Probability distributions – Discrete Probability Distributions: Binomial and Poisson probability distributions – Continuous Probability Distributions: Uniform and Exponential Probability distributions.		
MODULE – II	**BIVARIATE RANDOM VARIABLES**	**9**
Joint distributions – Marginal distributions – Covariance – Correlation Coefficient - linear regression – Central limit theorem (Statement only).		

MODULE – III	**STATISTICAL HYPOTHESIS TESTING**	**9**
Distribution of samples – Parameter Estimation – Statistical hypothesis – Large sample tests relying on Normal distribution for individual mean and mean difference - Test utilizing t for mean - Chi-square test for Goodness of fit.		
MODULE – IV	**EXPERIMENTAL DESIGN AND ANALYSIS**	**9**
One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.		
MODULE – V	**STATISTICAL QUALITY CONTROL**	**9**
Control charts for measurements (Mean and Range charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.		
		Total: 45 Periods

Text Books:

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 5th Edition, 2018.
2. Oliver.C.Ibe, 'Fundamentals of Applied Probability and Random Processes'', Elsevier India, 3rd Edition, 2021.
3. Freund John, E and Miller, Irvin, "Probability and Statistics for Engineering", Prentice Hall, 5th Edition2022.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 10th Edition, 2020.
2. Ronald E. Walpole, Raymond H. Myersand Sharon L. Myers "Probability and Statistics for Engineers and scientists ", Pearson India ,14th Edition, 2021.
3. Jay L.Devore," Probability and Statistic for Engineering and the Sciences", Cengage Learning, 10th Edition, 2021.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.swayam2.ac.in/cec21_ma02/preview
3. https://onlinecourses.nptel.ac.in/noc22_mg31/preview
4. https://onlinecourses.nptel.ac.in/noc20_ge05/preview

Laboratory Components using MATLAB:

S.No.	List of Experiments	CO Mapping	RBT
1	Poisson distribution	1	Apply
2	Uniform distributions	1	Apply
3	Marginal Distributions	2	Apply
4	Correlation Coefficient	2	Apply
5	Individual mean by Student's t - test	3	Apply

6	Goodness of fit by Chi – Square test	3	Apply
7	One way classification	4	Apply
8	Two way classification	4	Apply
9	Control Chart for Variables using Mean Chart	5	Apply
10	Control Chart for Variables using Range Chart	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**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	3	-	-	-	-	-	-	-	-	2	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	2	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	3	-	-	-	-	-	-	-	-	2	-
	3	High				2	Medium					1	Low	

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory			**Practical**		
	IAE I (5)	**IAE II (10)**	**IAE III (10)**	**Attendance [5]**	**Rubric based C/A [20]**	
Remember	10	10	10		-	10
Understand	10	10	10		40	30
Apply	30	30	30		60	60
Analyze	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

23MA401	NUMERICAL METHODS (Common to AIDS ,BME, CSBS, CSE, ECE, EEE, IT and M.Tech CSE)	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. Introduce the basic concepts of algebraic and transcendental equations.
2. Indicate the Numerical techniques of interpolation in various intervals.
3. Learn the concept of numerical techniques of differentiation and integration.
4. Study the numerical techniques in solving ordinary differential equations.
5. Provide the Numerical techniques in solving one dimensional and two dimensional heat equations.
6. Acquire proficiency in employing computational techniques to solve mathematical problems efficiently and accurately.

Course Outcomes

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

Co. No.	Course Outcome	Bloom's Level
CO1	Demonstrate the algebraic and transcendental equations.	Apply
CO2	Perform the numerical techniques of interpolation and error approximations in various Intervals**.**	Apply
CO3	Compute the numerical techniques of differentiation and integration for engineering problems.	Apply
CO4	Classify the numerical techniques for solving first order ordinary differential equations.	Apply
CO5	Illustrate the solution of boundary value problems.	Apply
CO6	Utilize computational techniques to solve mathematical problems efficiently and accurately.	Apply

Course Contents:

Module – I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	9
Solution of Algebraic and Transcendental equations – Newton - Raphson method- Solution of linear system of equations -Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi method and Gauss Seidel method.		
Module – II	**INTERPOLATION AND APPROXIMATION**	**9**
Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's interpolation formulae.		

Module – III	**NUMERICAL DIFFERENTIATION AND INTEGRATION**	**9**
Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rules – Two point and three point Gaussian quadrature formulae.		
Module – IV	**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS**	**9**
Single step methods: Euler's method – Fourth order Runge - Kutta method for solving first order equations – Shooting Method – Multi step methods: Milne's predictor corrector methods for solving first order equations.		
Module – V	**BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS**	**9**
Finite difference techniques for the solution of two dimensional Laplace's equations on rectangular domain – One dimensional heat flow equation – Bender Schmidt method by explicit – Crank Nicholson methods.		
		Total: 45 Periods

Text Books:

1. Grewal B.S, and Grewal J.S, '' Numerical methods in engineering and science "Khanna Publishers, 10th Edition, 2015.
2. Burden, R.L. and Faires, J.D, "Numerical Analysis" Cengage Learning, 9th Edition, 2016.
3. Gupta, S.K., "Numerical Methods for Engineers", New Age Publishers, Third Edition, 2015.

Reference Books:

1. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, New Delhi, 4th Edition, 2017.
2. Sastry, S.S., "Introductory Methods of Numerical Analysis", PHI Learning pvt Ltd, 5th Edition, 2015.
3. Jain, M.K., Iyengar, S.R.K. and Jain, R.K., "Computational Methods for Partial Differential Equations", New Age Publishers, 2016.
4. Curtis F.Gerald, Patrick.O. Wheatley, "Applied Numerical Analysis", Pearson Education, 8th Edition, 2022.

Additional References:

1. https://nptel.ac.in/courses/111/107/111107105
2. https://nptel.ac.in/courses/127/106/127106019
3. https://archive.nptel.ac.in/content/storage2/courses/122104018/node126.html

Laboratory Components using MATLAB:

S.No	List of Excercises	CO Mapping	RBT
1	Gauss Elimination Method	1	Apply
2	Gauss Seidel Method	1	Apply

3	Lagrange's Interpolation Formula	2	Apply
4	Newton's Forward and Backward difference formula	2	Apply
5	Trapezoidal Rule	3	Apply
6	Simpson's 1/3 rd rule	3	Apply
7	Euler's Method	4	Apply
8	Runge – Kutta Method	4	Apply
9	Finite Difference Method	5	Apply
10	Bender Schmidt method	5	Apply

Total: 30 Periods

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

	POs												PSOs		
COs	**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	2	2	1	-	-	-	-	-	-	-	-		1		
CO5	3	3	1	-	-	-	-	-	-	-	-		2		
CO6	3	2	2	-	-	-	-	-	-	-	-		2		
	3	High				2	Medium					1	Low		

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory			**Practical**		
	IAE I (5)	**IAE II (10)**	**IAE III (10)**	**Attendance [5]**	**Rubric based C/A [20]**	
Remember	10	10	10		-	10
Understand	10	10	10		40	30
Apply	30	30	30		60	60
Analyze	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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
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						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50]**
	Theory			**Practical**		
	IAE I (5)	**IAE II (10)**	**IAE III (10)**	**Attendance [5]**	**Rubric based C/A [20]**	
Remember	10	10	10			10
Understand	10	10	10		40	30
Apply	30	30	30		60	60
Analyze						
Evaluate						
Create						

23MC004	INDIAN CONSTITUTION (Common to all B.E. / B.Tech Programme)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Indian Constitution				

Course Objectives

The course is intended to

1. Know about the basic structure with the key elements of the Indian Constitution.
2. Enable students to grasp the Fundamental Rights, Directive Principles of State Policy and Fundamental Duties of our constitution.
3. Promote the students about our Union Government, political structure and their functions.
4. Prepare the students with the Indian judiciary and Election systems.
5. Learn the State Legislature, State politics and State planning commission in India.
6. Study the powers and functions of various constitutional offices and institutions.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Utilize the basic structure of Indian Constitution in real life situation.	Understand
CO 2	Relate their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	Understand
CO 3	Compare the Union Government, political structure and their powers and functions.	Understand
CO 4	Outline about our Indian Judiciary, Election Commission and Amendments.	Understand
CO 5	Summarize the power and functions of State Legislature.	Understand
CO 6	Realise the significance of the constitution and appreciate the role of constitution and citizen oriented measures in a democracy.	Understand

Course Contents

Module – I	INTRODUCTION TO INDIAN CONSTITUTION	6
The Historical background - Meaning of the term Indian Constitution - Necessity of the Constitution - Societies before and after the Constitution adoption - Introduction to the Indian constitution - Making of the Constitution, Role of the Constituent Assembly.		
Module – II	**FUNDAMENTAL RIGHTS**	**6**
Salient features of India Constitution - Preamble of Indian Constitution & Key concepts of the Preamble - Fundamental Rights (FR's) - its Restriction and limitations in different Complex Situations - Directive Principles of State Policy - its present relevance in Indian society - Fundamental Duties - its Scope and significance in Nation.		

Module – III	**UNION GOVERNMENT**	**6**
Union Government – Union legislature – Lok sabha – Rajya sabha (with powers and functions) -Union Executive – President (with powers and functions), Prime Minister (with powers and functions), Union Cabinet.		
Module – IV	**INDIAN JUDICIARY AND ELECTION COMMISSION**	**6**
Structure of Judicial System in India - Supreme Court - High Courts - District Courts - Role of Judiciary in India - Judicial Reviews and Judicial Activism. Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today.		
Module – V	**STATE LEGISLATURE**	**6**
Organization and Composition of State Legislature - Legislative Council - Composition of the Council - Composition of the Assembly - Qualifications for the Houses - Legislative Assembly - Duration of State Legislature - Duration of Assembly - Duration of Council.		
		Total : 30 Periods

Text Books

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, (23rd edn.) 2018
2. J.N. Pandey, The Constitutional Law of India, Allahabad; Central Law Agency,(55th edn.) 2018.
3. P.M Bakshi, Constitution of India, Universal Law Publishing House, NewDelhi, 1999.

Reference Books

1. Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. KB Merunandan, Bharatada Samvidhana Ondu Parichaya, Bangalore, Meragu Publications, 2015
3. K.Sharma, Introduction to the Constitution of India, Prentice Hall of India, NewDelhi, 2002.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

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								1				1		1
CO 2								1				1		1
CO 3								1				1		1
CO 4								1				1		1
CO 5								1				1		1
	3-High				**2-Medium**				**1-Low**					

Summative Assessment						
Bloom's Level	**Continuous Assessment (IAE)**					**Final Examination (FE)** **[50 marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	20	20	20	5		0
Understand	30	30	30			0
Apply						
Analyse						
Evaluate						
Create						

23MC006	SOFT SKILLS (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Improve language skills in personal and professional life.
2. Equip students with the vital communication and soft skills to succeed in the highly competitive international arena.
3. Focus on the fundamental soft skills and of their practical social and work place usage.
4. Learn to identify and overcome the barriers in interpersonal relationships.
5. Enhance employability skills and ensure career success.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Relate the significance and fundamental nature of soft skills.	Remember
CO 2	Take part in a wide range of Public speaking and professional group discussions.	Understand
CO 3	Plan one's time effectively and productively, especially at work.	Apply
CO 4	Make use of leadership skills to manage stress &conflict.	Apply
CO 5	Organize presentation effectively and participate in interview with confidence.	Apply

Course Contents

Module – I	Introduction to Soft Skills and Interpersonal Communication	**6**
An Introduction – Definition and Significance of Soft Skills; Interpersonal communication-types of interpersonal communication.		
Module – II	Public Speaking and Oral Communication Skills	**6**
Public Speaking: Skills, Methods, Strategies Group Discussion: Importance, Planning, Elements.		
Module – III	Time Management and Personality Development	**6**
Time Management – concepts and essentials tips. Personality-development – meaning, SWOT analysis & goal setting- Stress and conflict management.		
Module – IV	Leadership Skills and Emotional Intelligence	**6**
Leadership skills: Concept of Leadership and honing Leadership Skills- Problem-Solving Skills - Group and Ethical Decision-Making. Emotional Intelligence: Strategies to enhance Emotional Intelligence.		

Module – V	Interview Skills	**6**
Interviewer - Interviewee perspectives - Self Introduction and Presentation: Types, Content and Essential Tips–before, during and after a presentation, Overcoming Nervousness - Mock Interview.		
		Total : 30 Periods

Text Books

1. Managing Soft Skills for Personality Development–edited by B.N.Ghosh, McGraw Hill India, 2018.
2. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
3. English and Soft Skills–S.P. Dhanavel, Orient Black swan India, 2017.

Reference Books

1. Soft Skill Business and Professional Communication Book by Sutapa Banerjee,2016.
2. Communication Skills Book by PushpLata and Sanjay Kumar,2015.
3. Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: HarperCollins E-books, 2007.

Web References:

1. https://nptel.ac.in/courses/109/107/109107121/
2. https://onlinecourses.nptel.ac.in/noc22_hs77/preview
3. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mapping of Course Outcomes (CO) with Programme 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								1	2	3		2			
CO2								1	2	3		2			
CO3								1	2	3		2			
CO4								1	2	3		2			
CO5								1	2	3		2			
	3	**High**				**2**	**Medium**				**1**	**Low**			

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment 1 (50 Marks)	**Assessment 2 (50 Marks)**
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

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- 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 : 60 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.

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=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So
3. https://www.youtube.com/watch?v=Ff0LUTOCuLE&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&index=16

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									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**					

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	2.5			5	4	10
Understand	2.5	5	5		8	20
Apply		5	5		8	20
Analyse						
Evaluate						
Create						

23MC004	YOGA AND VALUES FOR HOLISTIC DEVELOPMENT (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Yoga				

Course Objectives

The course is intended to

1. Know the various types of yoga and their benefits.
2. Practice essential yoga postures and techniques.
3. Give mental clarity and focus through the practice of pranayama.
4. Incorporate relaxation technique into their daily routine works.
5. Use meditation to reduce stress and anxiety.
6. Promote positive health, prevention of stress related health problems and rehabilitation through Yoga.

Course Outcomes

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

CO.No	Course Outcome	Bloom's Level
CO 1	Balance their full potential and confidence.	Understand
CO 2	Understand the knowledge of fundamental yoga postures.	Understand
CO 3	Realize the enhanced the functions of inner organs.	Understand
CO 4	Achieve a deep state of relaxation and release physical and mental tension.	Understand
CO 5	Cultivate a sense of calm and well-being.	Understand
CO 6	Experience enhanced flexibility, strength and balance as well as reduced stress.	Understand

Course Contents

Module – I	INTRODUCTION TO YOGA	6
Foundations of Yoga - History and Development of Yoga - Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga - Introduction to Vedas – Upanishads - Prasthanatrayee - Purushartha Chatushtaya.		
Module – II	**POSTURES (ASANA)**	**6**
Trikonasana - Ardha-Kati – Chakrasana – Tadasana - Vrikshasana - Padmasana, Simhasana - Paschimottanasana, Uttanpadasana – Salabhasana - Shavasana Pawanmuktasana - Anti-Rheumatic Series - Digestive / Abdominal Group - Energy Bock Series - Back Strengthening Exercises - Sun Salutation (Surya Namaskar) - Classical Sequence.		
Module – III	**BREATHING**	**6**
The Foundations - Abdominal Breathing - Thoracic (mid-chest) breathing - Clavicular (upper chest breathing) - The Complete Yoga Breath. Pranayama Techniques - Breathing Ratios - Nadi Shodhana (Alternate Nostril Breathing) - Ujjayi (the ‘whispering breath’ or the ‘psychic breath’) - Bhramari (Humming Bee breath).		

Module – IV	**RELAXATION**	**6**
Quick Relaxation techniques - Tense & Relax - Short Yoga Nidra (Power Nap) - Extended Shavasana - Yoga Nidra – Sankalpa.		
Module – V	**MEDITATION**	**6**
Develop a good, comfortable sitting posture - Kaya Sthairyam (Body Stillness) - Om Chanting - Trataka (Concentrated Gazing).		
		Total : 30 Periods

Text Books

1. Stephen Sturges, The Yoga Book. Motilal Banarsidass, Delhi, 2004.
2. Singh S.P & Yogi, Foundation of Yoga, Standard Publication, New Mukesh Delhi, 2010.
3. Sahay G.S. HathaYoga Pradeepika of Svatmarama, MDNIY Publication, 2013.

Reference Books

1. Bhat, Krishna K. The Power of Yoga: SuYoga Publications Mangalore,2006.
2. Fenerstein, George, The Yoga Tradition: It's History, Literature, Philosophy practice, Bhavana Books and Prints, 2002.
3. Tiwari, O.P, Asana Why and How? Kaivalyadhama, Lonavla, 2011.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

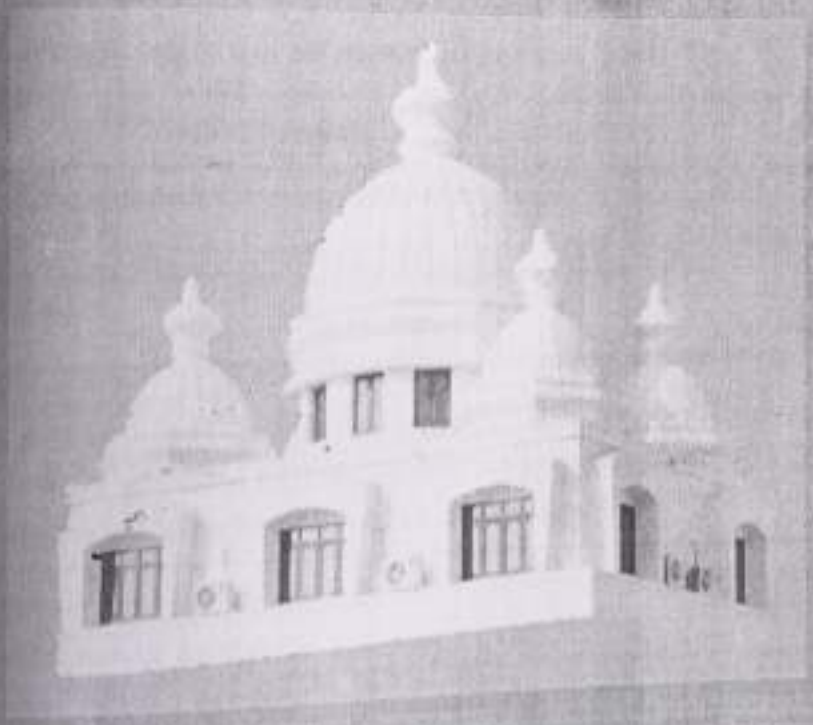
Summative Assessment						
Bloom's Level	**Continuous Assessment (IAE)**					**Final Examination (FE)** **[50 marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	20	20	20	5		0
Understand	30	30	30	5		0
Apply						
Analyse						
Evaluate						
Create						

B.E. Safety and Fire Engineering

CURRICULAM AND SYLLABI

III& IV Semester

Regulation – 2023



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III SEMESTER

		L	T	P	C
SF301	Principles of Safety Management	3	1	0	4
ture of Course	Engineering Science				
re requisites	Fire Engineering Fundamentals				

Course Objectives

The course is intended to

1. Create the awareness among students regarding importance of safety in industries.
2. Introduce the definitions, concepts, methodologies used in management of occupational safety in industries.
3. Categorize occupational safety and health hazards in the workplace.
4. Learn appropriate hazard controls following the hierarchy of controls.
5. Give students a foundation on theories of accident causation and prevention methods and carryout systematic accident investigation to identify the root causes.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Extend the knowledge and understanding of basic terms in safety management.	Understand
CO 2	Explain safety organizational requirements for effective safety management.	Understand
CO 3	Evaluate the workplace hazards and apply controls measures using hierarchy of control.	Apply
CO 4	Summarize accident investigation methodologies and apply systematic procedure to identify the root cause of the accident.	Understand
CO 5	Evaluate the safety performance of an organization	Apply

Course Contents

Module-I Introduction of safety 12

Safety-goals of safety engineering, Need for safety, safety and productivity – Definitions – Accident, Injury, Unsafe act, unsafe condition, Dangerous Occurrence, Reportable accidents. History of safety movements – Theories of accident causation-Applications-Evaluation based cases.

Module –II Prevention Methods and Training 12

Education and enforcement, Safety education and Training – importance, various training methods, effectiveness of training – Safety policy – work permit system - Government and voluntary agency in society – responsibility of management and employees-Industrial hybrid mode.

Module–III Monitoring Safety Performance 12

Frequency rate, severity rate, incidence rate, activity rate – cost of accidents – computation of costs – utility of cost data – plant safety inspection types – inspection procedures – safety sampling techniques – Safety surveys-Case studies.

Module–IV Accident Investigation 12

Why? When? Where? Who? How? Basics – man – environment systems – process of investigation – tools data collection – handling witnesses – case study – accident analysis – analytical techniques – MORT – Multi Events sequencing – TOR-Case study.

Module– V Safety Organization 12

Objectives, types, functions, Role of management – supervisors – workman, unions – government and voluntary agencies in society – safety officer – responsibilities – authority – safety committee – need, types – advantages-Cases with demo.

Total: 60 Periods

Approved in the Board of Studies 18.06.2024 Approved in Academic Council 20.07.2024

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Text Books:

1. Roger L. Brauer, Safety and Health for Engineers, by John Wiley & Sons, 3rd Edition Inc 20
2. N.V. Krishnan, Safety Management in Industry, Jaico Publishing House, 2007
3. Ronald P. Blake, Industrial Safety: Prentice Hall, New Delhi, 2013

Reference Books:

1. Ted S. Ferry, Modern Accident Investigation and Analysis, John Wiley & Sons 2007.
2. John V. Grimaldi and Rollin H. Simonds, Safety Management, All IndiaTraveller Book Seller, 2005Delhi.
3. Alan Waring, Safety Management System, Chapman & Hall, 2013.

Additional References:

1. https://www.digimat.in/nptel/courses/video/110105160/L01.html
2. https://iums.ac.ir/uploads/SafetyandHealthforEngineers_Second__95726.pdf
3. https://archive.nptel.ac.in/courses/110/105/110105160/

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			3	3					3	3	2	
CO2	3	3	2			3	3					3	3	2	
CO3	3	3	2			3	3					3	2	2	
CO4	3	3	2			3	3					3	3	2	
CO5	3	3	2			3	3					3	3	2	
	3	High				2	Medium					1	Low		

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

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

Passed in the Board of Studies 18.06.2024

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23SF302	Industrial Chemical Technology	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	NIL				

Course Objectives

The course is intended to

1. Educate students about the fundamental principles and concepts underlying chemical processes used in industrial setting
2. Instill a strong emphasis on safety protocols and environmental considerations in industrial chemical operations
3. Equip students in operating and maintaining equipment commonly used in chemical plants and laboratories
4. Enable the students to gain knowledge on various aspects of production engineering.
5. Provide the exposure on production in a chemical industry.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1.	Express production process of Sulfur, Sulfuric Acid and Cement	Understand
CO2.	Explain the fuel and industrial gases of fertilizer industry	Understand
CO3.	Deliver knowledge on various production methods pulp, paper, sugar and starch industries	Understand
CO4.	Identify refinery products of petroleum and petro chemical industries	Understand
CO5.	Compare various rubbers, polymers and synthetic fiber in chemical industries	Understand

Course **Contents:**

ODULE-I Sulfur, Sulfuric Acid and Cement 9

ulfur, Raw materials Sources, Mining and production of Sulfur – Sulfuric acid, Methods of oduction of Sulfuric acid – Contact process – Chamber process. Cement – properties of Cement – thods of production – Overall factors for Cement industry-Case study.

ODULE-II Fertilizer Industry, Fuel and Industrial Gases 9

ajor Components of Fertilizer industries – Nitrogen industries, ammonia, nitric acid, urea – Phosphorus dustries - Phosphorus, Phosphoric acid, Super Phosphate – Potassium chloride, Potassium Sulphate – dustrial gases – Carbon dioxide, hydrogen, nitrogen and oxygen-Examples.

ODULE-III Pulp, Paper, Sugar and Starch Industries 9

lp – Methods of production – Comparison of pulping processes. Paper – types of paper products, w materials, Methods of production. Sugar – Methods of production – by products of the Sugar dustry – Starch – Methods of production, Starch derivations-Cases-Virtual mode examples.

ODULE-IV Petroleum and Petro Chemical Industries 9

troleum – Chemical Composition, Classification of crude petroleum, Petroleum Refinery products troleum Conversion processes – Pyrolysis and Cracking. Acetylene and ethylene, opanol, Acrylonitrile, Buta diane – Chemicals from Aromatics - Benzene, Toluene and Xylene-IC ls-Application.

MODULE-V Rubbers, Polymers and Synthetic Fiber 9

Natural and Synthetic rubber, SBR – Silicone rubber – polymer – physical – chemical structure of polym Thermosetting and Thermoplastic materials - Polymer manufacturing processes – polyethylene, polyst – Resins phenolic and epoxy resins – Synthetic Fibers – Viscose rayon, Polyamides and polyesters studies.

Total: 45 Periods

Text Books:

1. Dryden, C.E, Outlines of Chemical technology, II Ed., Affiliate East West press, 2016.
2. Moulin, J.A., M. Makkee, and Diepen, A.V., Chemical Process Technology, Wiley, 2012.
3. Nicholas Chopey, Tyler Hicks Handbook of Chemical Engineering Calculations, 4th editi 2012.

Reference Books:

1. Austin, G.T., Shreve's "Chemical Process Industries", 12th ed., McGraw-Hill, 2012
2. Srikumar Koyikkal, "Chemical Process Technology and Simulation", PHI Learning Ltd (2010)
3. Michael and Irene Ash Specialty Chemicals Source Book-Third Edition 2 Volumes 2013

Additional References:

1. https://onlinecourses.nptel.ac.in/noc24_ch31/preview
2. https://onlinecourses.nptel.ac.in/noc24_ch09/preview
3. https://onlinecourses.nptel.ac.in/noc24_ch10/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	2	3				3					3	3	2	
CO2	3	2	3				3					3	3	2	
CO3	3	2	3				3					3	3	2	
CO4	3	2	3				3					3	3	2	
CO5	3	2	3				3					3	3	2	
	3	High				2	Medium					1	Low		

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

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

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23SF303	Safety aspects in Manufacturing Processes	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the basic concepts of safety management in manufacturing processes.
2. Learn various aspects of different manufacturing techniques such as various casting methods and Techniques.
3. Portray a broad knowledge on welding methods for making various joints.
4. Compare various metal forming processes such as Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
5. Acquire knowledge about the various tools, equipment, machinery and operations required for these metal forming processes.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain different metal casting processes, associated defects, merits and demerits.	Understand
CO2	Compare different metal joining processes	Understand
CO3	Summarize various hot working and cold working methods of metals.	Understand
CO4	Explain various sheet metal making processes.	Understand
CO5	Distinguish various safety management in manufacturing process.	Understand

Course Contents

MODULE-I Casting Processes 9

Molding sands - Types and Properties, patterns - types of patterns, selection of patterns - pattern allowances - Classifications of castings - according to mould materials and moulding methods. Furnace - moulding machines- Special casting techniques - defects in castings-safety guidelines in casting processes-Cases-Demo and evaluation.

MODULE-II Joining Processes 9

Welding safety tools and their functions- Classification of welding process: Principle of Gas welding, Arc welding, resistance welding, Solid State Welding, Thermochemical welding and radiant energy welding - Brazing and soldering-Case studies.

MODULE-III Metal Forming Process 9

Forging: Classification of forging processes - forging processes - forging defects and inspection. Hot and cold rolling process, process parameters, Drawing: Drawing of rods, wires and tubes-IC Tools.

MODULE-IV Sheet Metal Processes 9

Sheet metal forming methods: Shearing, Blanking, Bending, Stretch Forming, deep forming, Spinning: Forming processes. High Velocity Forming: Explosive forming, Electro hydraulic forming-magnetic pulse forming-Application in Industries.

MODULE – V Safety Management in Manufacturing 9

Safety Ethics Do's &Don'ts – Safety Measure Tools – Gloves – Shields – Helmets. Safety Problems – Control Phase – Long term &Short term Improvement – Reasons behind the type of injury-Cases and Quality examples.

Total: 45 Periods

Noted in the Board of Studies 18.06.2024

Approved in Academic Council 20.07.2024

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Text Books

1. P.C. Sharma, "A Text Book of Production Technology (Manufacturing Processes)", S. Chand & Company Ltd., New Delhi, Seventh Reprint, 2012.
2. Dr. Mohd. Parvez and Dr. Pallav Gupta "A Textbook on Manufacturing Processes" First Edition, IP Innovative Publication Pvt. Ltd.2021.
3. Mehul B Patel , Romilkumar M Patel and Sunil V Patel, "A Textbook of Manufacturing Process" first edition, Lambert academy publishing, 2020.

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1. Mikell P.Groover,"Fundamental of Modern Manufacturing", Wiley India Edition, Third Edition, Reprint, 2012.
2. P.L.Jain, "Principles of Foundry Technology", 5th edition Tata McGraw Hill, Fifth Edition, 2017.
3. P.N.Rao, "Manufacturing Technology", Volume-1, 5th edition Tata McGraw Hill, New Delhi, Third Edition, 2018P.C. Sharma, "A Text Book of Production Technology (Manufacturing Processes)", S. Chand & Company Ltd., New Delhi, Seventh Reprint, 2012.

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1. https://nptel.ac.in/courses/112107144/13 - courseco-ordinated by: iit roorkee
2. https://nptel.ac.in/courses/112107145/17-Dr. D. B. Karunakar Mechanical and Industrial Engineering Department Indian Institute of Technology, Roorkee
3. https://nptel.ac.in/courses/112107083/-Dr. D. B. Karunakar Department of Mechanical and Industrial Engineering Indian Institute of Technology, Roorkee

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			2		2	3	1	2	
CO2	3	3	3			2			2		2	3	1	2	
CO3	3	3	3			2			2		2	3	1	2	
CO4	3	3	3			2			2		2	3	1	2	
CO5	3	3	3			2			2		2	3	1	2	
	3	High				2	Medium					1	Low		

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

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

23SF304	Fluid Mechanics and Fluid Flow Machinery	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Engineering Mechanics				

Course Objectives

The course is intended to

1. Learn the properties of fluids and concept of control volume.
2. Know the applications of the conservation laws to flow through pipes.
3. Understand the importance of dimensional analysis
4. Discuss the importance of various types of flow in pumps.
5. Distinguish the significant 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
CO1	Identify the fluid properties and measure the flow characteristics	Understand
CO2	Evaluate the loss of energy in flow through pipes	Apply
CO3	Model the relationships for the flow parameters of fluids.	Apply
CO4	Examine the performance of pumps for a given application	Apply
CO5	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-Virtual online explanation.

MODULE-II **Flow Through Circular Conduits** 9

Reynolds's Experiment - Laminar flow through circular conduits –Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

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MODULE–III Dimensional Analysis 9

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

MODULE–IV Pumps 9

Classification of pumps – Centrifugal pumps – Working principle – Heads and efficiencies– Velocity triangles – Work done by the impeller – Performance curves – Reciprocating pump working principle –Rotary pumps-Cases.

MODULE–V Turbines 9

Impact of jets – Velocity triangles – Theory of rotodynamic machines – Classification of turbines – Working principles – Pelton wheel – Kaplan turbine – Work done – Efficiencies Performance curves for turbines – Governing of turbine-Industrial Applications.

Total: 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of the Coefficient of discharge of given Orifice meter	CO1	Apply
2	Determination of the Coefficient of discharge of given Venturi meter.	CO2	Apply
3	Calculation of the rate of flow using Rota meter	CO3	Apply
4	Determination of friction factor for a given set of pipes.	CO4	Apply
5	Conducting experiments and drawing the characteristic curves of centrifugal pump.	CO5	Apply

Total: 30 Periods

Text Books

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", 22nd edition Standard Book House New Delhi 2019.
2. Kumar K. L., "Engineering Fluid Mechanics", 4th Edition, Tata-McGraw Hill Pub, 2017.
3. Frank M. White and Henry Xue "Fluid Mechanics" 9th Edition, Tata-McGraw Hill Pub, 2022.

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", 2017
3. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", 9th edition McGraw Hill Publishing Co. 2017

Additional / Web References

1. http://www.efluids.com/
2. https://www.quora.com/What-is-fluid-machines
3. https://onlinecourses.nptel.ac.in/

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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	2										2	2	
CO 2	3	3	2										2	2	
CO 3	3	3	2										2	2	
CO 4	3	3	2										2	2	
CO 5	3	3	2										2	2	
	3	High				2	Medium					1	Low		

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

Bloom's Level	Summative Assessment Continuous Assessment Theory IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Practical Rubric based CIA [20 Marks]	Final Examination (Theory) [50 marks]
Remember	20	10	10		20	20
Understand	30	20	20		40	40
Apply	-	20	20		40	40
Analyse						
Evaluate						
Create						

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23SF305	Safety Elements Drawing Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	Engineering Graphics				

Course Objectives

The course is intended to

1. Familiarize the Indian Standards on drawing practices and impart knowledge of thread forms, fasteners, keys, joints and couplings.
2. Understand drawings of machine components leading to preparation of Assembly drawings manually and using CAD packages.
3. Describe the basic principles associated with CADD and to demonstrate common drafting techniques and shortcuts used by professionals.
4. Introduce the advanced capabilities of CADD and how they can be used to increase productivity.
5. Provide information about the CADD industry resources.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the drawings of machine components so as to prepare assembly drawings either manually and using standard CAD packages.	Apply
CO2	Sketch part drawings, sectional views and assembly drawings as per standards.	Apply
CO3	Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings	Apply
CO4	Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program	Apply
CO5	Improve visualization ability of machine components and assemblies before their actual fabrication through modeling, animation, shading, rendering, lighting and coloring	Apply

Contents to be covered for manual drawing

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

Contents to be covered for Computer Aided Drafting

To understand the fundamentals of CAD tools used in CAD software

Exercises(Manual and CAD)			
S.No	List of Experiments	CO Mapping	Revised Blooms Taxonomy
1.	Mantling and Dismantling of 3D Flange Couplings	CO1	Apply
2.	Assembly of Sleeve and Cotter Joint	CO2	Apply
3.	Mantling and Dismantling of Knuckle Joint	CO3	Apply
4.	Assembly of Plummer Block	CO4	Apply
5.	Assembly of Screw Jack	CO5	Apply
			Total : 30 Periods

Text Books
1. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013.
2. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 50th Edition, Charotar Publishers, 2014.
3. Dr.R.K.Dhawan, "Machine Drawing", 5th Edition, S.Chand Publishers, 2016.

Reference Books
1. Junnarkar,N.D., "Machine Drawing",PearsonEducation,1stEdition,2004.
2. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing" , published by Tata McGrawHill,2006
3. S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2008.

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1. http://www.nptel.ac.in/
2. http://www.sigmetrix.com/
3. https://archive.nptel.ac.in/courses/112/102/112102304/

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	2		2									3	
CO2	3	2	2		2									3	
CO3	3	2	2		2									3	
CO4	3	2	2		2									3	
CO5	3	2	2		2									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 Continuous Assessment [30 marks]	Model Examination [25 marks]	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

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23SF306	Manufacturing Technology Laboratory	L	T	P
		0	0	2
Nature of Course	Professional Core			
Pre requisites	Nil			

Course Objectives

The course is intended to

1. Provide ideas on the practical knowledge in Manufacturing.
2. Practice the various operations that can be performed in lathe machines.
3. Fabricate different types of components using the Machine tools.
4. Make various operation using Machine tools.
5. Understand and appreciate the importance of basic principles of Production Engineering.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Demonstrate the safety precautions exercised in the mechanical workshop.	Apply
CO 2	Make the work piece as per given shape and size using Lathe.	Apply
CO 3	Join two metals using arc welding.	Apply
CO 4	Use sheet metal fabrication tools and make simple tray and funnel.	Apply
CO 5	Use different moulding tools, patterns and prepare sand moulds.	Apply

List of Exercises

S.No	Exercises	CO Mapping	RBT LEVEL
	Safety Precautions		
1	Study of Laboratory Precautions, workshop , Special machines with rules and safety	CO 1	Apply
	Lathe		
2	Centering and Facing	CO 2	Apply
3	Plain Turing and Step Turning		
	Welding		
3	Lap joint using Gas welding	CO 3	Apply
4	Butt joint using Gas welding	CO 3	Apply
5	Tee joint using Gas welding	CO 3	Apply
	Sheet metal		
6	Fabrication of square tray and Funnel using sheet metal	CO 4	Apply
	Foundry		
7	Prepare a mould using Split pattern / Loose Piece Pattern.	CO 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			2				3	1	2	
CO2	3	3	2		2			2				3	1	2	
CO3	3	3	2		2			2				3	1	2	
CO4	3	3	2		2			2				3	1	2	

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CO5	3	3	2		2			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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IV SEMESTER

23SF401	Basic concepts of Fire Engineering	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Fire Engineering Fundamentals				

Course Objectives

The course is intended to

1. Enable refresh and understand basic science of fire engineering.
2. Interpret fire chemistry concept.
3. Represent the concept of fire physics and fundamentals of fire related science.
4. Learn strong foundation in basic fire engineering.
5. Compare the various fire control measures on completion of this course.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Clarify the various laws of basic physics	Understand
CO2	Identify the changes of Physics and chemical	Understand
CO3	Explain the various fore prevention and control methods	Understand
CO4	Distinguish the firefighting installations using water	Understand
CO5	Illustrate the firefighting installations using Ropes and Drills	Understand

Course Contents

MODULE-I Introduction of Fire Service 9

Units - Guidelines for writing the units - Force- resultant force - Laws of force - Laws of motion - Mass and weight- work- power- energy - Law of conservation of energy - Mechanics – rest and motion - Distance and displacement - Speed and velocity - Acceleration- retardation-Cases-Virtual demo.

MODULE-II Physics and Chemistry of Fire 9

Atomic structure - Elements- compounds - Pure substance and mixture - Physical and chemical chan Condition for the changes - Energy changes - - Combustion - Temperature - Catalyst - Neutralization Sublimation - Chemical reaction - Exothermic reaction and endothermic-Example and applications.

MODULE-III Fire Prevention & Control 9

Classification of fire - General Causes of fire - Detection of fire - Extinguishing methods - First aid firefighting equipments–Firefighting Drone, Robot, Helicopter- Fire bucket- Fire beater- hose real hose - Portable extinguisher - Operation - Maintenance – refilling – Building design and fire protection Cases.

MODULE-IV Fixed Firefighting Installations Using Water 9

Hydrant or fire water system - Classification of hydrant system - Sprinkling system - Major foam pour system - Steam drenching system - Emulsification - Air craft fire - Ships fire-Cases-Augmented real examples.

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DULE-V Fixed Firefighting Installations Without Using Water 9

plete CO2 flooding system - Complete DCP spraying system - Complete Halon flooding system- stigation of fire - Point- Time and cause of ignition – Ropes – various types of ropes- knots & uses – Squad – Discipline – Command and Control – parade-Information and communication tools- cations.

Total: 45 Periods

xt Books:

1. Daniel J. Limmer, Fire Service First Responde EMT-P, Michael Grill, Edition, 2012.
2. Hand book of fire and Explosion Protection Engineering Principles for Oil- Gas- Chemical and Related Facilities - Dennis. P. Nolan- 4th Edition, 2018
4. Jain V.K. "Fire safety in buildings" New Age International (P) Ltd., New Delhi.2010.

ference Books:

1. Engineering Chemistry by Jain and Jain 16th Edition. Author: Jain and Jain. Edition: Sixteenth-(16th) Publication: Dhanpatrai Publications.
2. A Handbook of Fire Technology by R.S.Gupta 2017
3. Barendra Mohan Sen,"Fire protection and prevention the essential handbook", UBS publishers and Dist., New Delhi, 2013.

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1. https://onlinecourses.nptel.ac.in/noc24_mg52/preview
2. https://onlinecourses.nptel.ac.in/noc23_ce42/course
3. https://onlinecourses.nptel.ac.in/noc24_ch09/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	2		2							3	3	3	
CO2	3	3	2		2							3	3	3	
CO3	3	3	2		2							3	3	3	
CO4	3	3	2		2							3	3	3	
CO5	3	3	2		2							3	3	3	
	3		High			2		Medium				1	Low		

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

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

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23SF402	Environmental Engineering and Management	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the various sources and types of environmental hazards, including natural and anthropogenic sources.
2. Identify potential receptors (humans, wildlife, ecosystems) that may be exposed to environmental contaminants.
3. Update skills in conducting HAZOP and FEMA studies to assess risks and develop preventive and mitigative measures.
4. Understand risk perception by different stakeholders and the public.
5. Understand the significance of emergency preparedness plans and their implementa in case of accidents or incidents.

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Identify and characterize various sources of environmental hazards, both natural and anthropogenic, and their potential impacts on human health, ecosystems, and the environment.	Understand
CO 2	Know the physical, chemical, and biological properties that influence the fate and transport of contaminants in the environment, as well as the processes and that control their movement and distribution.	Remember
CO 3	Discuss multimedia and multipath way exposure models to estimate contaminant concentrations in different environmental media, including air, water, soils, vegetation, and animal products.	Apply
CO 4	Express the risk assessments into decision-making processes for environmental management, and developing frameworks for making informed decisions that balance risks, costs, and benefits.	Apply
CO 5	Incorporate risk assessments, cost-benefit analyses, and stakeholder perspectives into decision-making processes, prioritizing risk management efforts based on the severity of risks and potential impacts.	Apply

Course Contents

MODULE- I Introduction of Environmental Hazards 9

Sources of Environmental hazards – Environmental and ecological risks – Environmental risk assess framework – Regulatory perspectives and requirements – Risk Analysis and Management and hist perspective; Social benefit vs technological risks; Path to risk analysis; Perception of risk, risk assess in different disciplines-Cases

MODULE- II Elements of Environmental Risk Assessment 9

Hazard identification and accounting – Fate and behavior of toxics and persistent substances environment – Properties, processes and parameters that control fate and transport of contamina Receptor exposure to Environmental Contaminants – Dose Response Evaluation – Exposure Assess – Exposure Factors-Case studies.

MODULE- III Tools and Methods for Risk Assessment 9

HAZOP and FEMA methods – Cause failure analysis – Event tree and fault tree modeling and analy

...ultimedia and multipath way exposure modeling of contaminant migration for estimation of contaminant ...oncentrations in air, water, soils, vegetation and animal products-Examples and applications.

MODULE- IV Risk Management 9

...isk communication and Risk Perception – comparative risks – Risk based decision making – Risk based ...vironmental standard setting – Risk Cost Benefit optimization and tradeoffs – Emergency Preparedness ...lans – Emergency planning for chemical agent release – Design of risk management programs – risk based ...emediation; Risk communication, adaptive management, precaution and stake holder involvement-Risk ...aluation.

MODULE- V Applications of Environmental Studies 9

Case studies on risk assessment and management for hazardous chemical storage – Chemical industries – Tanneries – Textile industries – Mineral processing and Petrochemical plants – Hazardous waste disposal facilities – nuclear power plants – contaminated site remediation – Case histories on Bhopal, Chernobyl, Seveso, Three Mile Island-Cases.

Total: 45 Periods

Text Books

1. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
2. Kasperson, J.X. and Kasperson, R.E. and Kasperson,R.E., Global Environmental Risks, V.N.University Press, New York, 2003.
3. Kofi Asante Duah, "Risk Assessment in Environmental management", John Wiley and sons, Singapore, 1998.

Reference Books

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff, "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
2. Risks and Decisions for Conservation and environmental management, Mark Burman, Cambridge University Press.
3. Susan L |Cutter, "Environmental Risks and Hazards" Prentice Hall of India, New Delhi, 1999.

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1. https://archive.nptel.ac.in/courses/127/105/127105018/
2. https://onlinecourses.nptel.ac.in/noc24_ge19/preview
3. https://onlinecourses.nptel.ac.in/noc22_ch33/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
CO 1	3	2	2	2			2		2				2	3	
CO 2	3	2	2	2			2		2				2	3	
CO 3	3	2	2	2			2		2				2	3	
CO 4	3	2	2	2			2		2				2	3	
CO 5	3	2	2	2			2		2				2	3	
	3	High				2	Medium					1	Low		

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

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

23SF403 / 23ME402	Thermal Engineering (Common to Mech, S&F)	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Learn the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
2. Know the thermodynamic concepts into various thermal application like Air Compressor
3. Understand the thermodynamic concepts into various thermal application like IC engines.
4. Learn the thermodynamic concepts into various thermal components and auxiliaries.
5. Learn the thermodynamic concepts into various thermal application like Gas Turbine

Course Outcomes

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

CO. No	Course Outcome	Bloom's Level
CO 1	Apply thermodynamic concepts to different air standard cycles and solve problems	Apply
CO 2	Solve problems in single stage and multistage air compressors	Apply
CO 3	Explain the functioning and features of IC engines, components and auxiliaries.	Understand
CO 4	Calculate performance parameters of IC Engines.	Apply
CO 5	Explain the flow in Gas turbines and solve problems.	Understand

Course Contents

MODULE- I Gas And Steam Power Cycles 9

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

MODULE- II Reciprocating Air Compressor **9**

Classification and comparison, working principle-Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors.

MODULE- III Internal Combustion Engines And Combustion **9**

IC engine – Classification, working, components and their functions. Theoretical and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke–Comparison of SI and CI engines. Desirable properties and qualities of fuels. – Lean and rich mixtures. Combustion in SI & CI Engines – Petrol and Diesel Knocking – phenomena and control.

MODULE- IV Internal Combustion Engine Performance and Systems **9**

Performance parameters and calculations- Heat Balance tests. Multipoint Fuel Injection system and Common Rail Direct injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging.

MODULE- V Gas Turbines **9**

Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combinations-IC tools for examples.

Total :45 Periods

Text **Books**

1. Rajput, "Thermal Engineering", Lakshmi publications, 10th edition, 2018.
2. Rudramoorthy R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2013.
3. Rs Khurmi "A Textbook of Thermal Engineering" S.Chand Publication, 2019

Reference **Books**

1. Kothandaraman.C.P.,Domkundwar.S. and A.V.Domkundwar., "A course in Thermal Engineering", DhanpatRai& Sons, Fifth edition, 2012
2. Arora.C.P, "Refrigeration and Air conditioning", Graw Hill publicationMc, 4th edition, 2021
3. Thermal Engineering by Mahesh Rathore Graw Hill publication, 2nd edition, 2022.

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1.https://onlinecourses.nptel.ac.in/noc23_me31/preview
2.https://iitg.ac.in/mech/academics/masters/fluids-and-thermal/
3.https://nptel.ac.in/courses/112103316

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

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

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Formative assessment			
Bloom's Level	Assessment Component	Marks	Total mark
Remember	Online Quiz	5	15
Understand	Tutorial Class / Assignment	5	
	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	10
Understand	20	20	20	30
Apply	20	20	20	60
Analyze				
Evaluate				
Create				

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23SF404	Occupational Health and First Aid	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand about the prevention of ill-health from work- through recognizing- evaluating and controlling the risks.
2. Learn "safe" systems- procedures
3. Understand various methods to be applied in the workplace or to the environment.
4. Apply safety and health related theory and technology- analyze workplaces to identify occupational hazards
5. Have knowledge in First aid & medical emergency procedures.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Explain the various important ingredients of health and risk with its tips	Understand
CO2	Discuss the occupational Health of various hazards with respect to safety Procedures	Understand
CO3	Recognize the Hygiene Occupation Health in various Hazards	Apply
CO4	Elucidate of different first aid provider systems	Understand
CO5	Express the basic of CPR Skills for First Aid in life support care	Understand

Course Contents

Module-I Important ingredients of health 9

Introduction – Health – Use of mind body communication to maintain wellness – emotional wellness – components of food – function of food – essential constituents of food – working of body organs – principal systems of body – tips for happiness – occupational health awareness-Applications.

Module- II Occupational Health – 1 & 2 9

Introduction – Occupational health risks – health hazards at work place – occupational diseases – airborne dust in working environment – physiology of respiratory system – pulmonary function tests – diabetes over view- Noise in industry– Need for occupational health care-Case study.

Module – III Occupational Health – 3 & Hygiene 9

Compensation & rehabilitation - Working women – working children – ESIs and other insurance schemes – tips to improve occupational health & safety – Community health – Introduction – work environment – indoor air quality – assessment of health risk – sources of information – Basic characterization- hazard identification and walk-through surveys - Dust sampling-Cases.

Module – IV First Aid Provider 9

Introduction – Legal considerations – Recognizing an emergency and helping procedure – Personal safety – removing contaminated gloves – Emergency medical services – Sudden Cardiac Arrest – Respiratory & circulatory systems – sudden cardiac arrest & early defibrillation – chain of survival-Cases.

Module –V Basic CPR Skills 9

Chest compressions – Rescue breaths – primary assessment: unresponsive person – Basic Life Support Care: unresponsive & breathing – unresponsive & not breathing – automated external defibrillators – basic AED operation –trouble shooting – chocking-IC Tools and applications.

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Total: 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Identify the cause of ingredients	CO1	Understand
2	Know the First Aid Log	CO2	Understand
3	Create Accident Investigation report &Accident Record	CO3	Apply
4	Proper first aid kit as per procedure	CO4	Apply
5	Operate the Fire Extinguisher as per procedure	CO5	Apply

Total: 30 Periods

Text Books:

1. Principlesof occupational health &hygiene : an introduction / edited by Sue Reed, Dino Pisaniello, GezaBenke& Kerrie Burton, Prentice Hall of India,New Delhi, 2nd Edition, 2013.
2. St. John Ambulance Reference Guide on First Aid, 4th Edition, 2019
3. Textbook of Occupational Health Ranabir Pal, S Dixit and J.Kishore, Pearsons Publications, 3rd Edition 2020

Reference Books:

1. Industrial Hygiene and Chemical Safety - M H Fulekar, 2nd Edition, 2006.
2. Occupational Safety & Health Management – Thomas J Anton, 2nd Edition, 2009
3. Introduction to Occupational Health in Public Health Practice-Bernard.J.John Wiley&Sons 3rd Edition 2021

Additional References

1. https://www.sja.ca/sites/default/files/202105/First%20aid%20reference%20guide_V4.1_Public.pdf
2. https://content.kopykitab.com/ebooks/2016/02/5777/sample/sample_5777.pdf
3. https://nptel.ac.in/online courses/occupational health.

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			3	3					3	3		
CO2	3	3	2			3	3					3	3		
CO3	3	3	2			3	3					3	2		
CO4	3	3	2			3	3					3	3		
CO5	3	3	2			3	3					3	3		
	3	High				2	Medium					1	Low		

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

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

23SF405	Thermal Engineering Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Study the value timing-V diagram and performance of IC Engines
2. Conduct performance test on IC Engines
3. Learn the Flash Point and Fire Point of various fuels / lubricants
4. Study the air compressor along with factors influencing its performance
5. Study the performance of refrigeration cycle / components

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO 1	Classify the IC engines and explain its working principle	Understand
CO 2	Determine the performance of I.C engines.	Apply
CO 3	Find the Flash Point and Fire Point of various fuels / lubricants.	Understand
CO 4	Explain the working of air compressor along with factors influencing its performance	Understand
CO 5	Determine the cooling load for refrigeration systems.	Apply

Approved in the Board of Studies 18.06.2024

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S.No	List of Experiments	CO Mapping	Revised Bloom's Taxonomy
1	Valve Timing and Port Timing diagrams.	CO 1	Understand
2	Performance Test on 4 – stroke Diesel Engine.	CO 2	Apply
3	Heat Balance Test on 4 – stroke Diesel Engine.	CO 2	Apply
4	Morse Test on Multi-cylinder Petrol Engine.	CO 2	Apply
5	Performance test on four stroke computerized diesel engine	CO 2	Apply
6	Determination of Flash Point and Fire Point of various fuels / lubricants.	CO 3	understand
7	Performance test on a reciprocating air compressor	CO 4	Apply
8	Determination of COP of a refrigeration system	CO 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	2						1	1		1	1	3	
CO2	3	2	2						1	1		1	1	3	
CO3	3	2	2						1	1		1	1	3	
CO4	3	2	2						1	1		1	1	3	
CO5	3	2	2						1	1		1	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 Continuous Assessment [30 marks]	Model Examination [25 marks]	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

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23EEE410	**Safety In Electrical Systems**	L	T	P	C
		3	0	0	3
Nature of Course	**Engineering Science**				
Prerequisites	Basics of Electrical and Electronics Engineering				

Course Objectives

The course is intended to

1. Recall the basic concepts of different types of electrical machines.
2. Summarize different types of electrical machines performance.
3. Outline the different methods of starting D.C motors.
4. Examine the different methods of starting induction motors.
5. Elaborate the concept of conventional and solid-state drives.
6. Develop the applications of AC & DC drives.

Course Outcomes

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

CO. No.	Course Outcome	Bloom's Level
CO1	Define basic elements, types of electrical drives and factors influencing selection of power rating for drive motors	Remember
CO2	Show and compare the mechanical characteristics of various drive motors	Understand
CO3	Summarize types of starters of A.C and D.C motors	Understand
CO4	Contrast the different methods of speed controlling D.C drives	Understand
CO5	Distinguish the different methods of speed controlling A.C drives	Understand

Course Contents

Module I	**Introduction to Electrical Safety, Shocks and Their Prevention**	10

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings.

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 and compound - single phase and three phase induction motors.

Module III	**Starting Methods**	8

Safety precautions - safe guards for operators - types of D.C Motor starters-Typical control circuits for shunt and series motors - Three phase squirrel cage 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- Safety provisions in Indian Electricity Act &Rules.

Module V	Conventional and Solid-State Speed Control of A.C. 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- Safe procedures for electrical maintenance.

Total: 45 Periods

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Text Books:

1. Nagrath.I.J.& Kothari.D.P," Electrical Machines", Tata McGraw-Hill, Edition,2016
2. Vedam Subrahmaniam, "Electric Drives (Concepts and Applications)", Tata McGraw-Hill,Edition,2010.

References:

1. Electrical Energy", Dhanpat RaiandSons,2017
2. Pillai.S.K " A First Course on Electric Drives", Wiley Eastern Limited,2012
3. Singh.M.D.,K.B.Khanchandani,"PowerElectronics",TataMcGraw-Hill,2006.

Web References

1. https://go-pdf.online/electric-drives-by-s-k-pillai.pdf

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								3	3		
CO2	3			2								3	3		
CO3	3			2								3	2		
CO4	3			3								3	3		
CO5	3			3								3	3		
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	Total marks
Remember	Online Quiz	5	15
Understand	Tutorial Class/Assignment	5	
	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	40	80
Apply				
Analyze				
Evaluate				
Create				

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23EE411	Safety in Electrical Systems Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional core				
Pre requisites	NIL				

Course **Objectives**

The course is intended to

1. Analyze the construction, principle of operation and performance of DC machines.
2. Test for starting and speed control of DC motors.
3. Understand the Principle of operation and performance of DC motors
4. Illustration the concept of DC Generators
5. Adequate knowledge about types of Starters.
6. Outline the characteristics and performance of machines.

Course **Outcomes**

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

CO .No.	Course Outcome	Bloom's Level
CO1	Test for determine the performance characteristics and speed control of DC shunt motors by conducting load test.	Analyze
CO2	Demonstrate the determination of losses and efficiency of D.C. machines and Transformers.	Understand
CO3	D.C. compound generators, D.C series motors and D.C. shunt motor	Understand
CO4	Examine the experiments to obtain the performance characteristics of DC Generators	Understand
CO5	Learn about the types of starters and construction.	Understand

List of **Experiments**

S.No	Name of Experiments	CO mapping	RBT Level
1	Load characteristics of D.C series motor.	CO1	Analyze
2	Load characteristics of D.C. shunt motor.	CO1	Understand
3	Swinburne's test of D.C machine.	CO2	Understand
4	Speed control of D.C shunt motor.	CO3	Understand
5	No load Test and Blocked Rotor Test on Three Phase Induction Motor.	CO3	Understand
6	Separation of No-load losses of three phase induction motor.	CO4	Analyze
7	Load characteristics of D.C. compound generator with differential and cumulative connections.	CO4	Analyze
8	Open circuit and load characteristics of D.C separately and self-excited shunt generator.	CO4	Apply
9	Study experiment on the construction of 3-point starter of a DC Machine.	CO5	Apply
10	Study experiment on the construction of 4-point starter of a DC Machine.	CO5	Apply

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
	Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			2							1	1	1	
CO2	3	2			2							1	2	1	
CO3	3	2			2							1	1	1	
CO4	3	2			2							1	1	1	
CO5	3	2			2							1	1	1	
	3	High				2	Medium					1	Low		

Assessment	Marks	Weightage	Marks		
			CA	FE	Total
Rubrics based continuous assessment	100	30	60	40	100
Preparatory examination	100	25			
Attendance	5	5			

Bloom's Level	Rubric based Continuous Assessment [30 marks]	Preparatory / Model examination (25 Marks)	Final Examination [40 marks]
Remember			
Understand	10	5	10
Apply	20	20	30
Analyze			
Evaluate			
Create			

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