

NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI

www.nec.edu.in



REGULATIONS – 2023

CURRICULUM & SYLLABUS

B. E. CIVIL ENGINEERING

(Outcome Based Education & Choice Based Credit System)

DEPARTMENT OF CIVIL ENGINEERING

I. VISION

Producing outstanding civil engineering professionals with human values to face future challenges

II. MISSION

- To provide with excellent teaching and research ambience.
- To prepare student for leadership roles in civil engineering.
- To facilitate student with lifetime skills and human values.
- To collaborate with industries to meet the ever challenging environment

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Will have a successful career in Civil Engineering.

PEO 2: Pursue advanced degrees in support of their chosen profession.

IV. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Apply technical Skills learnt through professional society events, certification programs, projects and/or lab exercise to provide sustainable solutions to civil engineering and business systems related to society and environment.

PSO 2: Apply their fundamental knowledge to crack state and national level competitive Examinations to have a successful career in public sectors.

V. PROGRAM OUTCOMES (POs)

PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

- PO 5 : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- PO 6 : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7 : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8 : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9 : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO 10 : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO 11 : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO 12 : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

REGULATIONS 2023

CURRICULUM AND SYLLABUS

SEMESTER - I

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Induction Programme – 2 weeks									0
Theory Courses									
1.	23SH11C	தமிழர் மரபு/ Heritage of Tamils	HSMC	1	0	0	0	1	1
2.	23SH12C	Mathematical Foundation for Engineers	BSC	3	1	0	0	4	4
3.	23SH13C	Introduction to Engineering	ESC	1	0	0	0	1	1
Integrated Courses									
4.	23SH14C	Technical English	HSMC	1	0	2	0	3	2
5.	23SH15C	Engineering Physics	BSC	2	0	2	0	4	3
6.	23SH16C	Engineering Chemistry	BSC	2	0	2	0	4	3
7.	23ME11C	Engineering Graphics	ESC	2	0	4	0	6	4
8.	23EE13C	Fundamentals of Electrical and Electronics Engineering	ESC	3	0	2	0	5	4
TOTAL				15	1	12	0	28	22

SEMESTER – II

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23SH21C	தமிழரும் தொழில் நுட்பமும் / Tamils & Technology	HSMC	1	0	0	0	1	1
2.	23GN01C	Aptitude Essentials	EEC	1	0	0	0	1	1
3.	23CE21C	Fourier Series, Complex Analysis and Calculus	BSC	3	1	0	0	4	4
4.	23CE22C	Environmental Science and sustainability	BSC	2	0	0	0	2	2
5.	23CE23C	Engineering Mechanics	ESC	3	1	0	0	4	4
Integrated Courses									
6.	23SH22C	Professional English	HSMC	1	0	2	0	3	2
7.	23CS11C	Problem solving Techniques	ESC	3	0	2	0	5	4
8.	23CE24C	Building Materials	PCC	3	0	0	2	5	4
Practical Courses									
9.	23GN02C	Innovation through Design Thinking	EEC	0	0	0	4	4	2
TOTAL				17	2	4	6	29	24

SEMESTER – III

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CE31C	Fluid Mechanics	ESC	3	1	0	0	4	4
2.	23CE32C	Biology for Engineers	BSC	3	0	0	0	3	3
3.	23CE33C	Statistics and Numerical methods	BSC	3	1	0	0	4	4
4.	23GN05C	Professional Ethics and Human values	HSMC	2	0	0	0	2	2
Integrated Courses									
5.	23CE34C	Solid Mechanics	PCC	3	0	2	0	5	4
6.	23CE35C	Surveying	PCC	3	0	2	0	5	4
7.	23CE36C	Building planning and Drawing	PCC	1	0	0	2	3	2
Practical Courses									
8.	23GN03C	Intellectual property Rights study	EEC	0	0	2	2	4	2
9.	23GN04C	Aptitude Excellence	EEC	0	0	2	0	2	1
TOTAL				18	2	8	4	32	26

SEMESTER – IV

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CE41C	Strength of Materials	PCC	3	0	0	0	3	3
2.	23CE42C	Water Supply Engineering	PCC	3	0	0	0	3	3
3.	-	Program Elective Course - I	PEC	3	0	0	0	3	3
4.	-	Open Elective Course – I	OEC	3	0	0	0	3	3
Integrated Courses									
5.	23CE43C	Hydraulics and Hydraulic machines	PCC	3	0	2	0	5	4
6.	23CE44C	Concrete Technology	PCC	3	0	2	0	5	4
7.	23CE45C	Soil Mechanics	PCC	3	0	2	0	5	4
Mandatory courses									
8.	23MC01C	Constitution of India	MAC	2	0	0	0	2	0
TOTAL				23	0	6	0	29	25

SEMESTER – V

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CE51C	Structural Analysis	PCC	3	1	0	0	4	4
2.	23CE52C	Design of Reinforced Concrete structures	PCC	3	1	0	0	4	4
3.	23CE53C	Foundation Engineering	PCC	3	0	0	0	3	3
4.	-	Program Elective Course - II	PEC	3	0	0	0	3	3
Integrated Courses									
5.	23CE54C	Wastewater Engineering	PCC	3	0	2	0	5	4
6.	23CE55C	Highway Engineering	PCC	3	0	2	0	5	4
Practical Courses									
7.	23CE56C	Design and Detailing Laboratory	EEC	0	0	2	2	4	2
8.	23CE57C	Data analysis Laboratory	EEC	0	0	0	4	4	2
TOTAL				18	2	6	6	32	26

SEMESTER – VI

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23CE61C	Construction Engineering and Management	PCC	3	0	0	0	3	3
2.	23CE62C	Design of Steel structures	PCC	3	1	0	0	4	4
3.	23CE63C	Estimation, costing and Valuation	PCC	3	0	0	0	3	3
4.	-	Program Elective Course - III	PEC	3	0	0	0	3	3
5.	-	Program Elective Course - IV	PEC	3	0	0	0	3	3
6.	-	Open Elective Course - II	OEC	3	0	0	0	3	3
Practical Courses									
7.	23CE64C	Estimation and costing Lab		0	0	2	2	4	2
8.	23CE65C	Product Development Practice	EEC	0	0	2	2	4	2
Mandatory courses									
9.	23MC03C	Indian Culture and Heritage	MAC	2	0	0	0	2	0
TOTAL				20	1	4	4	29	23

SEMESTER –VII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23GN06C	Project management and Finance	HSMC	2	0	0	0	2	2
2.	-	Program Elective Course - V	PEC	3	0	0	0	3	3
3.	-	Program Elective Course - VI	PEC	3	0	0	0	3	3
4.	-	Open Elective Course - III	OEC	3	0	0	0	3	3
Practical Courses									
5.	23CE71C	Mini Project	EEC	0	0	0	6	6	3
6.	23CE72C	Internship	EEC	0	0	0	12	12	2
TOTAL				11	0	0	18	29	16

SEMESTER –VIII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Practical Courses									
1.	23CE81C	Capstone Project / Industry Practice	EEC	0	0	2	2	4	6
TOTAL				0	0	2	2	4	6

Total No. of Credits: 167

CATEGORY OF COURSES

Category	I Sem.	II Sem.	III Sem.	IV Sem.	V Sem.	VI Sem.	VII Sem.	VIII Sem.	Credits	Percentage of credits
HSMC	3	3	2				2		10	6
BSC	10	6	7						23	14
ESC	9	8	4						21	13
PCC		4	10	18	19	12			63	38
PEC				3	3	6	6		18	11
OEC				3		3	3		9	5
EEC		3	3		4	2	5	6	23	14
Total	22	24	26	24	26	23	16	6	167	

Verticals
(Program Electives to be opted under the Verticals)

Vertical I (Structures)	Vertical II (Environmental and Water Resources)	Vertical III (Diversified)
Prestressed Concrete Structures	Solid and Hazardous Waste Management	Advanced Surveying
Prefabricated structures	Industrial Waste Management	Remote Sensing and GIS
Advanced Concrete technology	Air and Noise pollution control Engineering	Smart Cities
Finite Element Techniques	Environment policy and legislations	Energy Efficient Buildings
Computer Aided Design of structures	Hydrology	Sustainable Construction and Lean Construction
Advanced Structural Analysis	Environment Impact Assessment	Groundwater Engineering
Design of steel concrete composite structures	Climate change Adaption mitigation and management	-
Advanced steel structures	Soil Pollution Engineering	
Basics of Dynamics and Aseismic design	-	

Program Elective Courses

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Vertical - Structures									
1.	23CE01E	Prestressed Concrete Structures	PEC	3	0	0	0	3	3
2.	23CE02E	Prefabricated structures	PEC	3	0	0	0	3	3
3.	23CE03E	Advanced Concrete technology	PEC	3	0	0	0	3	3
4.	23CE04E	Finite Element Techniques	PEC	3	0	0	0	3	3
5.	23CE05E	Computer Aided Design of structures	PEC	3	0	0	0	3	3
6.	23CE06E	Advanced Structural Analysis	PEC	3	0	0	0	3	3
7.	23CE07E	Design of steel concrete composite structures	PEC	3	0	0	0	3	3
8.	23CE08E	Advanced steel structures	PEC	3	0	0	0	3	3
9.	23CE09E	Basics of Dynamics and Aseismic design	PEC	3	0	0	0	3	3
Vertical - Environment and Water Resources									
10.	23CE10E	Solid and Hazardous Waste Management	PEC	3	0	0	0	3	3

11.	23CE11E	Industrial Waste Management	PEC	3	0	0	0	3	3
12.	23CE12E	Air and Noise pollution control Engineering	PEC	3	0	0	0	3	3
13.	23CE13E	Environment policy and legislations	PEC	3	0	0	0	3	3
14.	23CE14E	Hydrology	PEC	3	0	0	0	3	3
15.	23CE15E	Environment Impact Assessment	PEC	3	0	0	0	3	3
16.	23CE16E	Climate change Adaption mitigation and management	PEC	3	0	0	0	3	3
17.	23CE17E	Soil Pollution Engineering	PEC	3	0	0	0	3	3
Vertical -Diversified									
18.	23CE18E	Advanced Surveying	PEC	3	0	0	0	3	3
19.	23CE19E	Remote Sensing and GIS	PEC	3	0	0	0	3	3
20.	23CE20E	Smart Cities	PEC	3	0	0	0	3	3
21.	23CE21E	Energy Efficient Buildings	PEC	3	0	0	0	3	3
22.	23CE22E	Sustainable Construction and Lean Construction	PEC	3	0	0	0	3	3
23.	23CE23E	Groundwater Engineering	PEC	3	0	0	0	3	3



Course Code	தமிழர் மரபு (HERITAGE OF TAMILS)	L T P E C
23SH11C	(Common to all B.E. / B.Tech. Degree Programmes)	1 0 0 0 1

COURSE OUTCOMES

இப்பாடம் முடிந்ததும் மாணவர்களிடம் வளரும் திறன்

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக் கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன்

CO2: தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன்

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக்கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன்

L:9

இந்திய மொழிக்குடும்பங்கள் - 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 - நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு - தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

Language Families in India - Dravidian Languages – Tamil as a Classical 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 - 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 - Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

CO2:தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன் **L:6**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி - இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிக்கல்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

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 - 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.

REFERENCES:

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 நாகரீகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளை – ஆற்றங்கரை நாகரீகம். (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 Civilization 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.

L: 15; TOTAL: 15 PERIODS

Course Code	MATHEMATICAL FOUNDATIONS FOR ENGINEERS	L	T	P	E	C
23SH12C	(Common to all B.E. / B.Tech. Degree Programmes)	3	1	0	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: interpret the nature of quadratic form by orthogonal transformation.

CO2: identify the maxima and minima of functions.

CO3: solve ordinary differential equations.

CO4: find the solution of partial differential equations.

CO5: evaluate integrals of multivariate calculus.

Soft skill Component

CO6 : develop communication, problem solving and interpersonal skills

CO1: interpret the nature of quadratic form by orthogonal transformation. L:9, T:3

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors – Diagonalisation of a matrix by orthogonal transformation – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation and its nature; Cayley – Hamilton theorem (excluding proof) - Application: Stretching of a elastic membrane.

CO2: identify the maxima and minima of functions. L:9, T:3

Functions of two variables: Limit, continuity and partial derivatives; Total derivative, Jacobian, Taylor series- Application : Linearization of Non Linear systems using Taylor Series - Maxima and minima - Method of Lagrange multipliers.

CO3: solve ordinary differential equations. L:9, T:3

Solutions of first order ordinary differential equations - Equations solvable for 'p', equations solvable for 'y', equations solvable for 'x' - Solutions of higher order linear differential equations with constant coefficients – Cauchy's and Legendre's linear equations - Method of variation of parameters – Solution of simultaneous linear differential equation. Application RCL – circuit and Mass Spring System.

CO4: find the solution of partial differential equations. L:9, T:3

Formation of partial differential equations – Solutions of standard types of first order partial differential equations - Lagrange's linear equations - Solutions of homogeneous and Non homogeneous linear partial differential equations of second and higher order with constant coefficient – Application - Shallow wave equations of first order PDE.

CO5 : evaluate integrals of multivariate calculus L:9, T:3

Double integration – Cartesian and polar coordinates - Change of order of integration - Change of variables - Cartesian to polar coordinates - Area as double integral - Triple integration - Cartesian and polar coordinates – Change of Variables- Cartesian to spherical and cylindrical coordinates. Application – Moments and centers of mass.

TEXT BOOKS:

1. Grewal.B.S., Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2021.
2. James E. Gentle, Matrix Algebra, Springer International Publishing, 2nd Edition, 2017
3. Shanker Rao.G., Linear Algebra, WileyIndia, 1st Edition , 2017

REFERENCES:

1. Bali.N.P. and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications Private Limited, 10th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India, 10th Edition, 2017.
3. Kenneth B. Howell, Ordinary Differential Equations, CRC Press, 2020.
4. James Stewart, Daniel Clegg, Saleem Watson, Essential Calculus Early Transcendentals, Cengage Learning, 9th Edition, 2021.
5. Nanda Kumar A.K, P.S.Datti: Raju .K.George , Ordinary Differential Equations, Cambridge University press, 2017.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code 23SH13C	INTRODUCTION TO ENGINEERING (Common to all B.E. / B.Tech. Degree Programmes)	L T P E C 1 0 0 0 1
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COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: articulate the importance of Engineering and its role in society through OBE framework

CO2: identify and describe academic pathways towards career settlement

CO1: articulate the importance of Engineering and its role in society through OBE framework **L:9**

Engineering – An introduction, Classification of different Engineering Disciplines, Role of Engineers in Society. Graduate Attributes (GA), Program Specific Criteria (PSC)- Program Educational Objectives (PEO), Program Outcomes (PO), Course Outcomes (CO), Choice Based Credit System (CBCS), course categories, teaching and learning process, active and passive learning, project / problem based learning, different assessments process.

CO2: identify and describe academic pathways towards career settlement **L:6**

Curriculum, cafeteria curriculum and self learning big picture of the Program and the significance of each course in the undergraduate Engineering Program, Discuss the different career paths for an engineering graduate. Career objective, competency requirement.

Case study: Each student has to interact with alumni mentors/seniors/faculty members/surf the internet and present a career path that inspires him/her at the end of the course

REFERENCES:

1. Quamrul H. Mazumder Introduction to Engineering, An Assessment and Problem Solving Approach, CRC Press, 1st Edition, 2016.
2. Saeed Moaveni, "Engineering Fundamentals an Introduction to Engineering", Cengage Learning, USA, 4th Edition, 2011.

L: 15; TOTAL: 15 PERIODS

Course Code	TECHNICAL ENGLISH	L	T	P	E	C
23SH14C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	2	0	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: apply the fundamental grammar rules in writing

CO2: utilizing phonetic transcription for pronunciation

Practical Component

CO3: apply the basic language skills in various aspects of communication

CO4: utilize technical terms and phrases in specific contexts

CO5: develop the pronunciation skill through various language components

CO6: distinguish different writing forms and interpret text through divergent thinking

CO7: develop effective reports with grammatical and language components

Soft skill Component

CO8: develop communication, team spirit, creativity and time management

CO1: apply the fundamental grammar rules in writing

**L:13,
P:26**

Parts of Speech - Word Formation using Prefix and Suffix - Sentence formation (Kinds of Sentences) - Tenses (Present, Past & Future tense) – Concord

CO3: apply the basic language skills in various aspects of communication

Diary Writing - Greeting and Self Introduction

CO4: utilize technical terms and phrases in specific contexts

Technical terms and extended definition - Essay Writing (Argumentative Essay and Analytical Essay) - Situational phrases & Conversation - Formal Letter Writing (Permission & Requisition letters)

CO6: distinguish different writing forms and interpret text through divergent thinking

Picture Description, Introduction to Reading Techniques (Skimming, scanning, inferring, predicting, Reading and Reviewing a book (Sci – Fi), E Mail Writing

CO7: develop effective reports with grammatical and language components

Listening and responding to general information (Business context) - Report Writing (Types, Structure, and Stages of report writing) - Checklist

CO2: utilizing phonetic transcription for pronunciation

L:2, P:4

Phonetics (Vowels & Consonants)

CO5: develop the pronunciation skill through various language components

Word Transformation from one form to another - Letter Writing (Informal) - Listening and responding to general information (General context)

TEXT BOOKS:

1. Paul V. Anderson, Technical Communication: A Reader - Centered Approach, Cengage Learning, 9th Edition, 2017.
2. Ravindra Nath Tiwari, Technical English-II, Shashwat Publication, 1st Edition, 2020.
3. Stephen D. Krashen, Principles and Practice in Second Language Acquisition. Pergamon, 1987.
4. Lester Kaufman and Jane Straus, The Blue Book of Grammar and Punctuation: An Easy-to Use Guide with Clear Rules, Real-World Examples, and Reproducible Quizzes, Wiley, 2021.
5. Wells H. G., The Time Machine, Penguin Classics, 2012.

REFERENCES:

1. Michael McCarthy, English Grammar: The Basics, Taylor & Francis, 2021.
2. Peter Lucantoni and Lydia Kellas, Cambridge IGCSE(TM) English as a Second Language Workbook, Cambridge University Press, 6th Edition, 2022.

L: 15; P: 30; TOTAL: 45 PERIODS

Course Code	ENGINEERING PHYSICS	L	T	P	E	C
23SH15C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	2	0	3

COURSE OUTCOMES:

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

Theory Components:

- CO1: identify the structural properties of crystalline materials
 CO2: comprehend and apply the concepts of centre of mass and elasticity
 CO3: explain thermodynamic parameters and fundamental laws and their application in various processes
 CO4: illustrate the applications of different lasers and optical fibers
 CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation

Practical Components:

- CO6: compare the mechanical properties of the materials due to bending and torsion
 CO7: analyze thermal conductivity of different bad conducting materials
 CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Soft skill Component:

- CO9: develop the team spirit and communication skill through group activities

CO1: identify the structural properties of crystalline materials **L:10**

Crystalline and amorphous materials - unit cell - primitive cell - crystal systems, Bravais lattices - Miller indices – interplanar distance – Characteristics of SC, BCC, FCC, HCP structures - Bragg’s law - X-ray diffraction and its applications - Synthesis of crystalline materials

CO2: comprehend and apply the concepts of centre of mass and elasticity **L:6,**

CO6: compare the mechanical properties of the materials due to bending and torsion **P:10**

Multi-particle dynamics - Introduction - Center of mass (CM) – CM of continuous bodies - Introduction to rigid bodies - translation - rotation – moment of inertia – theorems of moment of inertia – Torsional pendulum.

Elasticity – Stress - strain diagram and its applications - Moduli of elasticity and its relation - bending of beams - Bending moment – cantilever - theory and experiment - Uniform bending - theory and experiment – Non Uniform bending - I-shaped girders

CO3: explain thermodynamic parameters and fundamental laws and their application in various processes **L:6, P:8**

CO7: analyse thermal conductivity of different bad conducting materials.

Laws of thermodynamics – Thermo dynamical processes – Introduction to heat transfer – conduction - convection and radiation – thermal conductivity of good conductor –Radial flow of heat - Spherical shell method and cylindrical shell method – Thermal conductivity of poor conductor- Lee’s disc method– Applications - heat exchangers - refrigerators and ovens

CO4: illustrate the applications of different lasers and optical fibers **L:6,**

CO8: explore the light-matter interaction by the phenomenon of Interference and diffraction and photoelectric effect **P:6**

Lasers: Interaction of light with matter - Einstein coefficients and their relations – characteristics of laser - components of laser – Lasing action – Pumping methods – Types of Laser - Nd-YAG laser -semiconductor laser- Applications

Fiber optics: principle and classification of optical fibers – propagation of light in optical fiber - Numerical aperture and Acceptance angle – losses associated with optical fibers (Qualitative) – Fiber optic communication system - Applications - Displacement and pressure sensors – Endoscopy

CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation **L:6, P:2**

CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Planck’s radiation law - de-Broglie hypothesis – Matter waves - Heisenberg’s uncertainty principle – elementary proof – applications – Schrödinger’s time-dependent and time-independent wave equation – physical significance of wave function – Introduction to quantum tunneling - applications - particle in a one-dimensional box – tunneling microscope – quantum confinement in 0D, 1D, 2D systems - quantum computation

TEXT BOOKS:

1. Avadhanulu M. N., Kshirsagar P.G and Arun Murthy T.V.S, A Text book of Engineering Physics, S.Chand & Co, 11th Edition, 2018.
2. Kleppner D and Kolenkow R. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
3. Kenneth S Krane, Modern Physics, Wiley, 4th Edition, 2021.

REFERENCES:

1. Wolfson R., Essential University Physics, Volume 1 & 2, Pearson Education, 2nd Indian Edition, 2009.
2. Hitendra K. Malik, A.K.Singh, Engineering Physics, McGraw Hill Education, 2nd Edition, 2017.
3. Kyungwon An, Fundamentals of Laser Physics, World Scientific Publishing Company, 2023
4. Halliday D, Resnick R and Walker J, Principles of Physics, Wiley, 12th Edition, 2021.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	ENGINEERING CHEMISTRY	L	T	P	E	C
23SH16C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	2	0	3

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO2: apply the knowledge of corrosion to solve the industrial problems

CO3: describe the preparation, properties and their applications of smart materials in various sectors

CO4: describe the basic components and performance analysis of batteries

CO5: predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

Practical Component

CO6: estimate the amount of Ca^{2+} / Mg^{2+} , alkalinity and Chloride ion present in the water sample.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Soft skill Component

CO8: develop interpersonal, work ethics and communications skills for career settlement

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO6: estimate the amount of Ca^{2+} / Mg^{2+} , alkalinity and Chloride ion present in the water sample.

Introduction, sources and impurities in water, potable water specifications (as per WHO and BIS) - hardness-types-estimation of Ca^{2+} and Mg^{2+} ion in water by EDTA method. Alkalinity-types-determination of alkalinity of water -chronic daily intake - incremental life time risk - hazard quotient, hazard index, contamination factor - determination of chloride ion in water using Argentometric method-municipal water treatment- physical methods and chemical methods. Disinfection-internal conditioning - calgon and carbonate conditioning. Desalination-types-Reverse Osmosis (RO) process- Forward osmosis (FO) - electro dialysis - demineralization.

L:6, P:12

CO2: apply the knowledge of corrosion to solve the industrial problems.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Corrosion – mechanism of dry and wet corrosion-forms of corrosion– galvanic corrosion and differential aeration corrosion, crevice corrosion, pitting corrosion, microbial corrosion-stress corrosion, intergranular corrosion - determination of rate of corrosion by weight loss method.

L:6, P:6

Protection: cathodic protection, surface coatings, corrosion inhibitors. Corrosion of industrial components: corrosion and its control in power industries, automotive industries, chemical processing industries and marine industries.

CO3: describe the preparation, properties and their applications of smart materials in various sectors

L:6

Polymers: introduction - classification - functional polymers: electroluminescence polymer, biodegradable polymers, fire retardant polymer, thermo responsive polymer -

piezo, ferro and pyroelectric polymer - nanocomposites: introduction, synthesis, properties & applications- synthesis of nanocomposites using sol -gel process

CO4: describe the basic components and performance analysis of batteries

Introduction - components - operation principle - Lead acid – Nickel metal hydride batteries- Lithium ions batteries: Lithium polymer battery, Lithium sulphur battery - fabrication and performance evaluation- safety issues - battery management system - recycling of lithium batteries.

L:6

CO5:predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques.

Spectroscopy methods: Beer-Lambert’s law and its limitations– UV-visible spectroscopy and IR spectroscopy – principle - instrumentation– applications. Estimation of copper. Electro analytical methods: potentiometric titration - Estimation of Fe²⁺ ion by potentiometric method. Conductometric method- estimation of HCl by conductometric titration- pH metric method-Estimation of HCl by pH metric titration-applications. Thermal analytical methods: Thermal Gravimetric Analysis (TGA) and Differential Thermal Analysis (DTA)- Thermo Mechanical Analysis (TMA) –principle - instrumentation - Thermo gravimetric analysis of CuSO₄.5H₂O- applications.

L:6, P:12

TEXT BOOKS:

1. Jain P.C. and Jain M, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2021.
2. Dara S.S and Umare S.S, A Text Book of Engineering Chemistry, S.Chand & Company Limited, 20th Edition, 2018.
3. Agarwal S, Engineering Chemistry, Cambridge Publishing Company, 2nd Edition, 2019

REFERENCES:

1. Benjamin M. M, Water Chemistry, Waveland Press, 2nd Edition, 2019.
2. Cicek V, Corrosion Engineering, Springer Publishing, 1st Edition, 2021.
3. Shahinpoor. M, Fundamentals of Smart Materials, Publisher: Royal Society of Chemistry, 1st Edition, 2020.
4. Berg H, Bernhardsson S, and Johansson P, Electric Vehicle Batteries: Moving from Research towards Innovation, Publisher: Springer, 1st Edition, 2019.
5. Crouch S, Skoog D, Holler F, Principles of Instrumental Analysis, 2017.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	ENGINEERING GRAPHICS	L	T	P	E	C
23ME11C	(Common to MECH, CIVIL, AIDS, EEE, IT)	2	0	4	0	4

COURSE OUTCOMES:

Upon the successful completion of the course, the student will be able to

- CO1: Construct the Engineering Curves and Perform Freehand Sketching.
 CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina
 CO3: Draw the Projections of Simple Solids in Different Positions.
 CO4: Visualize the Sectional Views and Surface of Various Solids.
 CO5: Draw the Isometric and Perspective Projections of Various Solids.

CO1: Construct the Engineering Curves and Perform Freehand Sketching.

L:6, P:12

Principles of Engineering Graphics – significance. Usage of Drawing Instruments. Lettering and dimensioning exercise Construction of ellipse, parabola and hyperbola using eccentricity method– Construction of cycloids, Epi and Hypo-cycloids. Orthographic views of simple components by Free hand drawing - Transferring measurement from the given object to the free hand sketches.

CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina

L:6, P:12

Principle of orthographic projections – Conventions - First angle and third angle projections. Projections of points placed in all quadrants – projections of straight lines – inclined to both reference planes - determination of true length and inclinations. Projections of regular polygonal surfaces and circular lamina inclined to both reference planes.

CO3: Draw the Projections of Simple Solids in Different Positions.

L:6, P:12

Projections of simple solids like prisms, pyramids, cylinder and cone - axis inclined to one reference plane - change of position method.

CO4: Visualize the Sectional Views and Surface of Various Solids.

L:6, P:12

Sectioning of simple solids – Axis perpendicular to horizontal plane- Drawing sectional views with true shape of the section. Development of lateral surfaces of truncated solids – Prisms, pyramids, cylinder and cone.

CO5: Draw the Isometric and Perspective Projections of Various Solids.

L:6, P:12

Principles of isometric projection – Isometric scale – Isometric projections of simple solids like prism, pyramid, cone and cylinder – Combination of solids. Perspective projections of simple solids by visual-ray method

TEXT BOOKS:

1. Bhatt N.D, “Engineering Drawing”, 54th Edition, Charotar Publishing House, 2023.
2. Shah M.B and Rana B.C, “Engineering Drawing”, Pearson Education, 2nd Edition, 2009.

REFERENCES:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Agrawal B. & Agrawal C.M., “Engineering Graphics”, TMH Publication, 2nd Edition, 2013
3. Narayana K.L. & Kannaiah P, “Text book on Engineering Drawing”, Scitech Publishers, 2011.
4. Gopalakrishna K.R, “Engineering Drawing”, Subhas Publications, 32nd Edition, 2017.

L: 30; P: 60; TOTAL: 90 PERIODS

Course Code
23EE13C

**FUNDAMENTALS OF ELECTRICAL AND
ELECTRONICS ENGINEERING**

L	T	P	E	C
3	0	2	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: Demonstrate the characteristic parameters of DC and AC circuits.

CO2: Explain the working of AC and DC machines.

CO3: Describe the analog and digital instruments for monitoring and control.

CO4: Demonstrate the operation of electronic and digital devices for applications.

CO5: Infer the purpose of wiring and safety.

Practical Component

CO6: Analyze basic electric circuits and characteristics of electrical machines.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

CO8: Perform residential wiring and measure earth resistance.

CO1: Demonstrate the characteristic parameters of DC and AC circuits.

L:9, P:6

Sources - Passive Elements – Electrical Quantities: Voltage, Current, Power and Energy – DC circuits: Ohms Law – Kirchhoff's Laws – Mesh analysis - AC Circuits: Waveforms, RMS, Peak, real power, reactive power and apparent power, power factor.

CO6: Analyze basic electric circuits and characteristics of electrical machines

1. Verification of Ohms Law and Kirchhoff law.
2. Measurement of AC signal parameter (Peak-Peak, RMS, Period and Frequency)

CO2: Explain the working of AC and DC machines.

L:9, P:8

Construction, Types of DC motors – Working Principles – Need for Starters - AC Motors: Construction and Working of Single Phase and Three Phase Induction Motor– Servomotor -Stepper motor.

CO6: Analyze basic electric circuits and characteristics of electrical machines.

1. Analyse the characteristics of DC Shunt Motor and DC series motor
2. Load test on single phase and three phase induction motor

CO3: Describe the analog and digital instruments for monitoring and control.

L:9, P:2

Analog instruments: Functional Elements, Principles: PMMC, MI, And Electrodynamometer wattmeter – Digital voltmeter – energy meter - multimeter – DSO –Multifunction meter.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

1. Calibration of single phase energy meter using wattmeter

CO4: Demonstrate the operation of electronic and digital devices for applications.

L:9, P:6

Characteristics and applications: Diode – Rectifiers, Zener Diode – Regulators, BJT - LEDs – Photo Diodes, Opto-Isolators- Binary Number System – Logic Gates: Basic gates, Universal gates – Boolean Algebra –ADC and DAC.

CO7: Demonstrate the functionality of instruments and characteristics of electronics devices.

1. Experimental Verification of PN Junction diode as rectifiers.
2. Experimental Verification of Zener Diode as Voltage Regulators.
3. Verify the truth table of logic gates.

CO5: Infer the purpose of wiring and safety.

L:9, P:8

Diagrams & Symbols used in basic Electrical wiring -Electric shock -Protection: PPE, Switches, Plug and Socket, Fuse, MCB, ELCB, MCCB and Earthing- Wiring & installations- Inverters – UPS- Energy Consumptions –Electrical safety and standards– Schematic Electrical Layout for building.

CO8: Perform residential wiring and measure earth resistance.

1. Measurement of Earth Resistance using Electrical Equipment.
2. Residential house wiring, Staircase wiring and selection of fuse.

TEXT BOOKS:

1. D.P. Kothari and I J Nagrath, “Basic Electrical and Electronics Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. R.K.Rajput, “Basic Electrical and Electronics Engineering”, University Science Press, 2017.

REFERENCES:

1. Lionel Warnes, “Electrical and electronics engineering: Principles and practice, Palgrave Macmillan publication, 3rd Edition, 2003.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, Tata McGraw Hill, Revision 1st Edition, 2011.
3. David Bell, “Electronic Devices and Circuits”, Oxford university press, 5th Edition, 2008.
4. Mohamed A. El-Sharkawi, “Electric Safety Practice and Standards”, Taylor & Francis, 2013.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	தமிழரும் தொழில்நுட்பமும் (TAMILS AND TECHNOLOGY)	L	T	P	E	C
23SH21C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

- CO1:** தமிழர்களின் நெசவு மற்றும் பாணைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.
- CO2:** தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் கணிணித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.

Upon the successful completion of the course, the student will be able to

- CO1:** Know and explain about Tamils weaving and Pottery technology, Design and construction Technology and Manufacturing Technology.
- CO2:** Know and explain about Tamils Agriculture and irrigation technology, Scientific Tamil and Tamil computing

- CO1:** தமிழர்களின் நெசவு மற்றும் பாணைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் மற்றும் உற்பத்தித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன் **L:9**

சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிகப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்- சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக்கலை- கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல் மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

- CO1: KNOW AND EXPLAIN ABOUT WEAVING AND CERAMIC TECHNOLOGY, DESIGN AND CONSTRUCTION TECHNOLOGY, MANUFACTURING TECHNOLOGY**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries

(BRW)– Graffiti on Potteries - 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- 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 beads - Archeological evidences – Gemstone types described in Silappathikaram.

CO2: தமிழர்களின் வேளாண்மை, நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் கணிணித் தமிழ் பற்றிய அறிவு மற்றும் விளக்கும் திறன். L:6

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்- அறிவியல் தமிழின் வளர்ச்சி - கணிணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

CO2: KNOW AND EXPLAIN ABOUT AGRICULTURE TECHNOLOGY, IRRIGATION TECHNOLOGY, SCIENTIFIC TAMIL & TAMIL COMPUTING

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- 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.

REFERENCE BOOKS:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணிணித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருதை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils(Dr.K.K.Pillay)A joint publication of TNTB & ESC and RMRL
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 Civilization 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 TamilNadu (Dr.K.K.Pillay) (Published by: The Author)

L: 15; TOTAL: 15 PERIODS

Course Code	APTITUDE ESSENTIALS	L	T	P	E	C
23GN01C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES:

Upon the completion of the course the students will be able to

CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly

CO2: Develop problem solving skills on Numbers and enhance arithmetic ability

CO3: Infer appropriate comparison and distribution methods using ratio and to form equations

CO4: Improve quantitative skills and solve problems on percentages and profit loss

CO5: Calculate data interpretation and data sufficiency in quantitative aptitude

CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly L : 3

Numeric series – Finding missing numbers – Odd number out series - Letter series – Symbol series - Alphanumeric series

CO2: Develop problem solving skills on Numbers and enhance arithmetic ability L : 3

Number Types - HCF & LCM – Square root- Cubic root - divisibility criteria- Unit digit calculation- Prime factors

CO3: Infer appropriate comparison and distribution methods using ratio and to form equations L : 3

Ratio & Proportion: Comparison of Ratios - Variations: Direct and indirect proportion
Ages: Present Age, Past Age & Future calculation

CO4: Improve quantitative skills and solve problems on percentage and profit loss L : 3

Concept of Percentage – Percentage calculation - Calculation of Percentage on Population Results on Depreciation .Profit and Loss –Percentage of Profit and Loss – Discount

CO5: Calculate data interpretation and data sufficiency in quantitative aptitude L : 3

Data Interpretation – Pie Chart – Bar Chart – Table Chart .Data Sufficiency in Logical Reasoning : Numbers, Ratio, Ages, Percentage and Profit Loss

REFERENCES:

1. Dr.R.Aggarwal, “ Quantitative Aptitude”, S Chand Publishing, Revised Edition 2017
2. R.V.Praveen, “Quantitative Aptitude and Reasoning” , 3rd Edition , Eastern Economy Edition, PHI Learning 2016

Video Materials

Profit Loss

<https://youtu.be/PpVO7I8dx6U>
https://youtu.be/cW7_BUDYcw

Number series

<https://youtu.be/4ZJFkFE2XU>
<https://youtu.be/83nJmniFmNk>

Numbers

<https://youtu.be/81pwuMJ8OIU>
https://youtu.be/VT_N9cacgl4

Square root and Cube root

<https://youtu.be/nJSqsaT0AgU>
<https://youtu.be/Hyhws8P9KY>

Problems on Ages

<https://youtu.be/6PCTRVmu-ek>
https://youtu.be/eAI3BvO_Ipw

Data Interpretation

<https://youtu.be/s99rda8e0vc>

L: 15; TOTAL: 15 PERIODS

Course Code	FOURIER SERIES, COMPLEX ANALYSIS AND	L	T	P	E	C
23CE21C	CALCULUS	3	1	0	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: perform Fourier series expansion of the functions.

CO2: calculate the Fourier series solution of Wave and Heat equation.

CO3: interpret analytic function in transformations.

CO4: evaluate complex integration over contour.

CO5: analyze the concepts related to vector field.

CO 1 : perform Fourier series expansion of functions

Dirichlet's conditions – General Fourier series – Half range series – Complex form of Fourier series – Parseval's identity – Harmonic analysis – Identification of frequencies **L:9,T:3**

CO2 : calculate Fourier series solution of Wave and Heat equation

Fundamentals of Fourier series - Half range Fourier series - Classification of Partial Differential Equations - Fourier series solutions of one dimensional wave equation - One dimensional heat equation - Steady state solution of two dimensional heat equation (Insulated edges excluded). **L:9,T:3**

CO3 : interpret analytic function in transformations

Analytic functions - Necessary and Sufficient conditions (excluding proofs) - Harmonic and orthogonal properties of analytic functions - Harmonic conjugate - Construction of analytic functions - fluid flow problems - Conformal mapping: $w = z+c$, cz , $1/z$ and bilinear transformation. **L:9,T:3**

CO4 : evaluate complex integration over contour

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula (excluding proofs) – Taylor's and Laurent's expansions - Singular points - Residues - Residue theorem (excluding proof) - Application of residue theorem to evaluate real integrals - Unit circle and semi - circular contour (excluding poles on boundaries). **L:9,T:3**

CO5 : analyze the concepts of calculus in vector fields

Differentiation of vectors: Gradient, Divergence, Curl and Directional derivatives – Line, Surface and Volume Integrals - Statement of Green's, Gauss divergence and Stokes' theorem - Simple applications involving rectangular parallelepiped and cubes. **L:9,T:3**

TEXT BOOKS:

1. Grewal.B.S. Higher Engineering Mathematics, 44th Edition, Khanna Publications, Delhi, 2021.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2017.

REFERENCES:

1. Bali.N.P. and Manish Goyal, A Textbook of Engineering Mathematics, 10th Edition, Laxmi Publications Private Limited, 2018.
2. Jain.R.K. and Iyengar.S.R.K., Advanced Engineering Mathematics, 5th Edition, Narosa Publishing House Private Limited, 2016

3. Ramana B.V, Higher Engineering Mathematics, Tata Mc-Graw Hill Publishing Company, New Delhi, 2017.
4. Michael D .Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education, 2021.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	ENVIRONMENTAL SCIENCE AND	L	T	P	E	C
23CE22C	SUSTAINABILITY	2	0	0	0	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

CO1 : Explain the functions of environment, ecosystems and biodiversity and their conservation.

CO2 : Analyze the causes, effects of environmental pollution and natural disasters.

CO3 : Apply the understanding of renewable and non-renewable resources.

CO4 : Apply the goals of sustainable development for technological and societal development.

CO5 : Demonstrate the knowledge of sustainability practices, energy cycles .

CO 1: Explain the functions of environment, ecosystems and biodiversity and their conservation

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

L:6

CO 2 Analyze the causes, effects of environmental pollution and natural disasters

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and EWaste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

L:6

CO 3 Apply the understanding of renewable and non-renewable resources

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

L:6

CO 4 Apply the goals of sustainable development for technological and societal development

Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

L:6

CO 5 Demonstrate the knowledge of sustainability practices, energy cycles

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

L:6

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Pearson Education, 2004.

REFERENCES:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38th Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

L:30; TOTAL : 30 PERIODS

Course Code	ENGINEERING MECHANICS	L	T	P	E	C
23CE23C		3	1	0	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: Analyze equilibrium of particles and solve problems.

CO2: Determine the support reactions, equilibrium of rigid bodies in 2D and 3D.

CO3: Explain the significance of centroid, center of gravity and moment of inertia.

CO4: Explain the effect of friction on equilibrium and its principles to analyze and solve problems

CO5: Apply principles of dynamics, work-energy, impulse momentum, and impact on elastic bodies.

CO1: Analyze equilibrium of particles and solve problems.

L : 9, T : 3

Introduction–Units and Dimensions–Laws of Mechanics–Force Systems – Basic concepts, System of Forces, Coplanar Concurrent Forces, Resolution and addition of forces, resultant of several concurrent forces-Lame's theorem, Parallelogram and triangular Law of forces–Equilibrium of a particle–Forces in space–Principle of transmissibility.

CO2: Determine the support reactions, equilibrium of rigid bodies in 2D and

L:9,T : 3

3D

Free body diagram - Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples– Moment of a force about a point and about an axis, Vectorial representation of moments and couples– Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.

CO3: Explain the significance of centroid, center of gravity and moment of inertia. L : 9,T : 3

Determination of Areas and Volumes– First moment of area and the centroid of sections – Rectangle, circle, triangle from integration – T section, I section – Angle section, Hollow section by using standard formula -Second and product moment of rectangle, triangle and circle from integration - Second moment of area for T section, I section, Angle section and Hollow section using standard formula - Polar moment of inertia - Principal moments of inertia of plane areas - Principal axes of inertia - Significance of mass moment of inertia (concept only).

CO4: Explain the effect of friction on equilibrium and its principles to analyze and solve problems L : 9,T : 3

Friction: Types of friction, Limiting friction, Laws of friction –simple contact friction–ladder friction – wedge friction– Rolling resistance – Belt friction – Translation and Rotation of Rigid Bodies

CO5: Apply principles of dynamics, work-energy, impulse momentum and impact on elastic bodies. L : 9,T : 3

Displacements, Velocity and acceleration, their relationship – Projectile motion – Newton's law of motion - D' Alembert principle - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies Definition – time of compression, restitution, collision – laws of conservation of momentum – coefficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact- Introduction to dynamics of rigid bodies - General Plane motion (Concept only).

TEXTBOOKS:

1. Beer,F.P. and Johnson Jr.E.R., Vector Mechanics for Engineers,Vol.1 Statics and Vol.2 Dynamics, McGraw Hill International,11th Edition, 2017.
2. Palanichamy, M.S., Nagan, S., “Engineering Mechanics – Statics & Dynamics”, Tata McGraw–Hill, 2018

REFERENCES:

1. Rajasekaran S and Sankarasubramanian G, Fundamentals of Engineering Mechanics, Vikas Publishing House Private Limited, 3rd Edition, 2017.
2. Hibbeler R.C., Engineering Mechanics, Vol.1 Statics, Vol.2 Dynamics, 12th Edition, Pearson Education Asia Private Limited, 2018.
3. Irving H Shames, Engineering Mechanics Statics and Dynamics, Pearson Education Asia Private Limited, 4th Edition, 2018.
4. Ashok Gupta, “Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)”, Pearson Education Asia Pvt., Ltd., 2012.

L:45;T: 15;TOTAL: 60 PERIODS

Course Code	PROFESSIONAL ENGLISH	L	T	P	E	C
23SH22C	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	2	0	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: extend the primary language skills to develop critical thinking

CO2: build the secondary language skills for professional competence

Practical Component

CO3: apply the vital sub-functions of listening in particular context

CO4: take part in propagating ideas through effective oral communication

CO5: inferring information using various reading techniques

CO6: construct professional content via distinct methods of writing

Soft skill Component

CO7: develop interpersonal, communicational and behavioral attributes

CO1: extend the primary language skills to develop critical thinking

CO3: apply the vital sub-functions of listening in particular context

CO4: take part in propagating ideas through effective oral communication

If Conditionals – Standard Abbreviations –Types of Listening (Comprehensive, Informational, Critical Listening) –One Word Substitution, Components of Speaking Listening for Specific Information –Listening to Speech (Oxford Union Society) – Listening to Science Talks or Theories

Product Description – Chart Description – Process Description – Group Discussion (Uses – Structure – Strategies – Team Work – Positive & Negative Body Languages – Samples – Demo)

CO2: build the secondary language skills for professional competence **L:6, P:16**

CO5: inferring information using various reading techniques

CO6: construct professional content via distinct methods of writing

Synonyms – Intensive and Extensive Reading –Error Spotting (Based on Concord, Pronoun, Articles & Adverb Placement)– Writing Style (Persuasive, Expository & Descriptive)

Newspaper Reading – Reading Comprehension (Fiction & NonFiction)

Business Letters for Quotations and Clarification, Placing Orders and Making Complaints – Proposal Writing – Job Application Letter & Resume Preparation – Paragraph Writing – Content Writing

TEXT BOOKS

1. Lucantoni, Peter & Lydia Kellas. “English as a Second Language Workbook”, 6th Edition, Cambridge University Press, 2022.
2. Twain, Mark. “The Adventures of Tom Sawyer”, 1st Edition, Pegasus, 2012.
3. Clear, James. “Atomic Habits”, 1st Edition, Dreamliners, 2022.
4. Garcia, Hector & Francesc Miralles. Ikigai: The Japanese Secret to a long and Happy Life.

1st Edition, Tuttle Publishing, 2021.

5. Elbow, Peter, “Writing with Power” 2nd Edition, Oxford University Press, 1998.

REFERENCES

1. Butterfield, Jeff. “Soft Skills for Everyone”. 2nd Edition, Cengage, 2020
2. Raman, Meenashi & Sangeetha Sharma. Professional English. 1st Edition, Oxford University Press, 2018

L: 11; P: 34; TOTAL: 45 PERIODS

Course Code	PROBLEM SOLVING TECHNIQUES	L	T	P	E	C
23CS11C	(Common to all B.E. / B.Tech. Degree Programmes)	3	0	2	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems

CO2: apply fundamental, sequential, conditional logic statements and arrays for solving basic problems

CO3: implement modular programming concept using user defined functions

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions

CO5: develop file processing application programs

Practical Component

CO6: develop programs for simple algorithms using sequential and Control structures

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

CO8: develop application programs using structures and files concept.

CO1: apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems L:6

Overview of programming: Problem Solving in Everyday Life, Types of Problem, Computer-based problem solving, Algorithms - Building blocks of algorithms (statements, control flow, functions) - Notation (pseudo code, flow chart) – Problem solving aspect – Top down design – Implementation of algorithms – Program Verification – Efficiency of algorithms – Analysis of algorithm.

CO2: apply fundamental, sequential, conditional logic statements and arrays for solving basic problems L:12, P:10

Data Types - Constants – Variables - Keywords – Operators– Problem Solving using fundamental algorithms. Control Statements: Branching and Looping - Algorithms Using Selection and Repetition - Summation of a set of numbers, Reversing Digits of an Integer - Implementation of fundamental algorithms and factoring methods - Array Techniques - Array order reversal, Array Counting, Finding maximum and the minimum value in a set

CO6: develop programs for simple algorithms using sequential and Control structures

Solve problems using control statements (Decision making and Looping)

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Problem solving based on Array Handling(1D and 2D, Multi-dimensional arrays, traversal, rotation) - Solve problems to handle strings

CO3: implement modular programming concept using user defined functions

L:10, P:8

Modular Programming approach: Modularization and recursion - Bubble Sort, Selection Sort, Linear Search, Binary Search, Implementation of sorting and searching

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Solve problems by using modular approach (Functions and Recursion)

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions

**L:12,
P:10**

Pointer Concept – add numbers using call by reference – finding maximum number from list of numbers - permutations of a given string using pointers – Implementation of function returns a pointer;

Structures & Union - finding the largest element of an array using Dynamic Memory Allocation – Implementation of Student database in structure using Dynamic Memory Allocation;

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Build efficient solutions to manage memory efficiently through Pointers.

CO8: develop application programs using structures and files concept.

Develop applications using Structures

CO5: Develop file processing application programs

L:5, P:2

File Handling: Files - Introduction, Types of file processing: Sequential access, Random access – Implementation of word count, copy file, Voter's age validation, Marks range validation

CO8: Develop application programs using structures and files concept.

Develop applications using Files

TEXT BOOKS:

1. Maureen Sprankle and Jim Hubbard, Problem Solving and Programming Concepts, Prentice Hall, 9th Edition, 2012.
2. R.G Dromey, How to solve it by Compute, Pearson education, Delhi, 2nd Edition, 2021.

REFERENCES:

1. Behrouz A. Forouzan, Richard F.Gilberg, P.Golda Jeyasheeli, G.Priyanka, S.T.Veena , Problem solving Using C A Structured Programming Approach, Volume I & II, 1st Edition, Cengage Publication, 2022
2. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, BCS Learning & Development Limited, 1st Edition, 2017.
3. Byron S. Gottfried, Jitendar Kumar Chhabra, Programming with C, Tata McGraw Hill Publishing Company, New Delhi, 4th Edition, 2018.
4. Kernighan B.W., Ritchie D.M., C Programming Language (ANSI C), Prentice Hall of India Private Limited., New Delhi, 2nd Edition, 2010.
5. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, New Delhi, 2018.
6. Yashavant P. Kanetkar, Let Us C, BPB Publications, 16th Edition, 2020
7. H. M.Deitel, P. J. Deitel, C How to Program, Pearson Education., New Delhi, 7th Edition, 2016.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	BUILDING MATERIALS	L	T	P	E	C
23CE24C		3	0	0	2	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: Classify the basic building materials and explain its relevant application

CO2: Demonstrate the typical and prospective uses of lime, cement, and aggregates

CO3: Describe the process for producing concrete and its applications

CO4: Explain the applications of timbers and other materials

CO5: Illustrate the applications of Modern building materials

Soft skill Component

CO6 : develop team spirit, communication, problem solving and interpersonal skills related to basic and modern building materials with the help of field study and presentation.

CO1: Classify the basic building materials and explain its relevant application. L:9,E:6

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks.

Experiential Activity

Prepare a report on different types of stones and bricks available in the market with its uses.

CO2: Demonstrate the typical and prospective uses of lime, cement, and aggregates L:12,E:6

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency –

Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

Experiential Activity

Prepare a report on different grades and types of cements available in the market with its application

CO3: Describe the process for producing concrete and its applications **L:6,E:6**

Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

Experiential Activity

Arrange a visit to the ready mix plant and prepare a report on it.

CO4: Explain the applications of timbers and other materials **L:9,E:6**

Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminium composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumen.

Experiential Activity

Give a presentation on different types of paints, varnishes, distempers , plywoods and Bitumen available in the market

CO5: Illustrate the applications of Modern building materials. **L:9,E:6**

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles– Geo-membranes and Geotextiles for earth reinforcement.

Experiential Activity

Give a presentation on geotextiles, geomembranes available in the market and mention it's application on the field

TEXT BOOKS:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Gambhir.M.L., "Concrete Technology", 5th Edition, Tata McGraw Hill Education, 2017
3. Anil Kumar Misra, "Building Materials and Construction", S.Chand & Company Ltd, 2017

REFERENCES:

1. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2017.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems", Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2017.
3. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
4. IS4926 - 2003: Indian Standard specification for ready–mixed concrete, 2012
5. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011
6. IS1542-1992: Indian standard specification for sand for plaster, 2009
7. IS 10262-2019: Indian Standard Concrete Mix Proportioning –Guidelines, 2019.
8. IS 2386-2021: Indian Standard for Methods of test for aggregates for concrete, 2021.

L: 45,E:30; TOTAL: 75 PERIODS

Course Code	INNOVATION THROUGH DESIGN THINKING	L	T	P	E	C
23GN02C	(Common to all B.E. / B.Tech. Degree Programmes)	0	0	0	4	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Experiential Component

CO1: Analyse the impact of design thinking process.

CO2: Practice design thinking process through real world problems.

Soft skill Component

CO3: Present survey conclusions on selected real-world problems.

CO1: Analyse the impact of design thinking process 30

Design thinking process: history and phases -Ideation tools: brainstorming, mind mapping, scrambler method, six thinking hats -case studies.

CO2: Practice design thinking process through real world problems 30

Real world problem selection-Practicing the preliminary stages of design thinking process
- work presentation.

TEXT BOOKS

1. Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, "Design Thinking: The Handbook", WS Professional, 2020
2. PavanSoni, "Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem solving", Penguin Random House, 2020

REFERENCES

1. Michael Lewrick, "The Design Thinking Playbook", Wiley, 2019
2. Kathryn Christopher, "Design Thinking in Engineering", Kendall Hunt Publishing Company, 2019
3. Robert Curedale, "Design Thinking Process & Methods" Design Community College Inc, 5th Edition, 2019
4. David Lee, "Design Thinking in the Classroom", Ulysses Press, 2018
5. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
6. Monika Hestad Silvia Rigoni Anders Grnli, "The Little Booklet on Design Thinking: An Introduction", Zaccheus Entertainment, 2nd Edition, 2017
7. Scott Swan, Michael G.Luchs and Abbie Griffin, "Design Thinking: New Product Development Essentials", Wiley-Blackwell, 2016
8. D.M. Arvind Mallik, "Design Thinking for Educators", Notion Press, 2019

E:60; TOTAL:60 PERIODS

23GN05C	Professional Ethics and Human Values	L	T	P	E	C
	(Common to all B.E. / B.Tech. Degree Programmes)	2	0	0	0	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

CO1: Recognize and practice the core human values and theories related to ethical behavior.

CO2: Analyze the engineering ethical breach from past study.

CO3: Distinguish and apply safety, responsibility and rights in workplaces.

CO1: Recognize and practice the core human values and theories related to ethical behavior **L: 10**

Moral dilemmas and moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy –Case studies: Vigil mechanism, Whistle blowing - Protected disclosures - Personal ethics, work ethics and human values - Governing Regulation.

CO2 : Analyze the engineering ethical breach from past study **L: 10**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - Case study: The challenger disaster

CO3 : Distinguish and apply safety, responsibility and rights in workplaces **L: 10**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Collegiality and loyalty - respect for authority – confidentiality; Collective bargaining, Conflicts of interest - Case study; Occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination. Case studies: The Three mile island and Chernobyl disaster

TEXT BOOKS

1. Mike W Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York, 5th Edition, 2022

REFERENCES

1. Behnam Taebi, “Ethics and Engineering: An Introduction”, Cambridge University Press, 2021
2. AjeshFaizal, Aswathy S U, Roy V I, “Professional Ethics in Engineering: an Industry Perspective”, Noor Publishing, 2021
3. R.S. Naagarazan, “A Textbook on Professional Ethics and Human Values”, New age International Pvt. Ltd; 3rdedition, 2022
4. Dr. P. Elamurugan, “Professional Ethics in Engineering”, Notion Press, 2021

L:30; TOTAL:30 PERIODS

Course Code	FLUID MECHANICS	L	T	P	E	C
23CE31C		3	1	0	0	4

COURSE OUTCOMES

Upon Successful completion of this course, the students will be able to

CO1: Illustrate the basic fluid properties.

CO2: Determine the pressure, hydrostatic forces and the development of continuity equation in the fluid.

CO3: Compute the rate of flow and losses in pipes.

CO4: Describe the concepts of boundary layer.

CO5: Explain the idea of dimensional and model analysis with other model/prototype problems.

CO1: Illustrate the basic fluid properties.

L:7 , T:3

Scope of Fluid mechanics - Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties: Density, Specific weight, Specific gravity, viscosity, Compressibility, Bulk modulus, Surface tension, capillarity, vapour pressure.

CO2: Determine the pressure, hydrostatic forces and the development of continuity equation in the fluid.

L:11, T:3

Pascal's Law and Hydrostatic equation – Pressure measurement - Buoyancy – Meta centre - Forces on plane and curved surfaces - Fluid Kinematics - Classification of fluid flows - Continuity equation (one, two and three dimensional forms) – Velocity potential functions and Stream function - Flow net.

CO3: Compute the rate of flow and losses of energy in pipes

L:10, T:3

Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Major and minor losses of flow in pipes.

CO4: Describe the concepts of boundary layer

L:8, T:3

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness - Drag force on a flat plate due to boundary layer – Separation of boundary layer concept.

CO5: Examine the idea of dimensional and model analysis with other model / prototype problems.

L:9, T:3

Dimensional Analysis – Methods of dimensional analysis (Rayleigh's method, Buckingham's Pi-theorem) – Model analysis - Types of forces acting in moving fluid – Dimensionless numbers – Model laws and its problems.

TEXT BOOKS:

1. Bansal R.K, Fluid mechanics & Hydraulic machines, Laxmi Publishing Private Limited, New Delhi, 11th Edition, 2024.
2. Modi, P.N & Seth, S.M “Hydraulics and fluid Mechanics”, Standard book house, New Delhi, 21st Edition, 2017.
3. Yunus A. Cengel , John M. Cimbala , Fluid Mechanics: Fundamentals and Applications, Tata McGraw Hill Education Private Limited, New Delhi, 4th Edition, 2017

REFERENCES:

1. Jain A.K., “Fluid Mechanics including Hydraulic Machines”, Khanna Publishers, New Delhi,

2016.

2. Ramamrutham S, Hydraulics Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, 9th Edition, 2014
3. Subramanya.K; Fluid Mechanics and Hydraulic Machines; Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2018.

L: 45; T : 15 ; TOTAL: 60 PERIODS

Course Code	BIOLOGY FOR ENGINEERS	L	T	P	E	C
23CE32C		3	0	0	0	3

COURSE OUTCOMES:

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

CO1: describe the fundamental concepts Species evolution and cell biology

CO2: explain the structure and stability of biomolecules

CO3: comprehend the structure and function of enzymes

CO4: interpret the major bio-energetic pathways

CO5: explain the analytical techniques used for the analysis of biomolecules

CO1: describe the fundamental concepts in species evolution and cell biology **L L:9**

Modern concept of natural selection and speciation- Lamarckism, Darwinism/Neo-Darwinism - classification based on cellularity and ultrastructure. Cell - prokaryotic and eukaryotic cells-Structural and function of mitochondria, chloroplast, lysosomes, golgi bodies, plasma membrane, cytoskeleton, cell wall and nucleus-cell cycle-cell division: mitosis and meiosis. Photosynthesis: photovoltaic cells, bionic leaf. Human Blood substitutes; hemoglobin-based oxygen carriers (HBOCs)

CO2: explain the structure and stability of biomolecules **L:9**

Introduction to bio molecules - Monomeric units and polymeric structures of sugars, starch, cellulose, amino acids, proteins, nucleotides and DNA/RNA, and lipids. Molecular interactions: covalent and non covalent interactions –methods to measure the interactions. Antigens-antibodies interaction.

CO3: comprehend the structure and function of enzymes **L:9**

Introduction, classification of enzymes - specific activity- enzyme activity- chemical nature of enzymes. Protein and non protein nature of enzymes. Metalloenzymes and metal activated enzymes. Coenzymes and cofactors- prosthetic group, coenzymes involved in different metabolic pathways. Lock and key, induced fit and transition state hypotheses. Mechanism of enzyme catalysis- acid-base catalysis, reversible and irreversible Inhibition. Factors affecting the enzyme activity; Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation- enzyme mediated reactions. Industrial applications of enzymes: biosensors and bio bleaching.

CO4: interpret the major bio-energetic pathways **L : 9**

Thermodynamics in biological systems, exothermic and endothermic versus endergonic and exergonic reactions, concept of K_{eq} and its relation to standard free energy, spontaneity, ATP as an energy currency. Glucose synthesis: Glycolysis and Krebs cycle.

Energy yielding and energy consuming reactions. Concept of energy charge. Regulation of blood glucose and homeostasis - glycogenesis and glycogenolysis and their regulation - measurement of blood glucose level.

CO5: explain the analytical techniques used for the analysis of biomolecules L:9

Chromatographic techniques: principle and applications of column chromatography, TLC and HPLC. Microscopic Techniques: principle and applications of Fluorescence microscopy, Scanning electron microscopy, Transmission Electron microscope. Spectroscopic techniques: principle and applications of UV-Visible spectroscopy, Fluorescence spectroscopy and Mass spectroscopy. ELISA and Western blot.

TEXT BOOKS:

1. Y. Nelson, L. David, Lehninger, Principles of Biochemistry, International Edition. New York: W. H. Freeman, Macmillan Learning, 8th Edition, 2021.
2. Nagata, Kazuhiro, Real-Time Analysis of Biological Interactions, Springer, Japan, 3rd Edition, 2015.
3. Bibekanand and Mallick, Biology for Engineers, McGraw Hill Education, 1st Edition, 2021.
4. Thyagarajan S, Biology for Engineers, McGraw Hill Education, 1st Edition, 2013.

REFERENCES:

1. P.N.Bartlett, Bioelectrochemistry: Fundamentals, Experimental Techniques and Applications, 2nd Edition, John Wiley & Sons, 2014.
2. Ratner and Hoffmann, Biomaterial Science: An Introduction to Materials in Medicine, 2nd Edition, 2015.
3. D.V. Vranken, G.A.Weiss, Introduction to Bioorganic Chemistry and Chemical Biology, CRC, Taylor & Francis, 1st Edition, 2012.

L: 45; TOTAL: 45 PERIODS

Course Code	STATISTICS AND NUMERICAL METHODS	L	T	P	E	C
23CE33C		3	1	0	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: calculate the various measures of dispersion.

CO2: apply the principles of hypothesis testing in small and large samples.

CO3: analyze the variances in design of experiments.

CO4: apply numerical techniques to solve algebraic equation and calculate derivatives and integrals.

CO5: compute numerical solution of differential equations.

CO1 : calculate the various measures of dispersion

Central tendencies - Mean, median, mode - Measures of Dispersion: Mean deviation, and Quartile Deviation - Carry out performance study on measures of central tendencies: Case Study through software – Moments – Skewness – Kurtosis - Correlation and Regression.

L:9, T:3

CO2 : apply the principles of hypothesis testing in small and large samples

Sampling distributions - Estimation of parameters - Statistical hypothesis – Central limit theorem - Large sample tests based on Normal distribution for single mean and difference of means - Confidence interval for mean - Chi-square distribution- Contingency table for independent of attributes – Goodness of fit.

L:9,T:3

CO3 : analyze the variances in design of experiments

Tests based on t and F distributions for mean, variance and proportion - ANOVA - One way and two way classifications - Completely randomized design – Randomized block design – Latin square design – 2^2 factorial design.

L:9,T:3

CO4: apply numerical techniques to solve algebraic equation and calculate derivatives and integrals

Solution of Algebraic and transcendental linear equations - Newton - Raphson Method- Solution of simultaneous equations – Gauss Elimination method – Gauss Jacobi’s method- Gauss Seidel method – Interpolation – Lagrange’s Method - Numerical Differentiation – Newton’s forward difference and backward difference formula – Numerical integration - Single integration using Trapezoidal and Simpson’s 1/3 rd and 3/8 th rules.

L:9,T:3

CO5 : compute numerical solution of differential equations

Taylor’s Series Method – Euler’s Method – Runge Kutta fourth order Method – Predictor - corrector Methods – Milne’s Method - Solution of one dimensional heat equation by explicit and implicit methods - Two dimensional Laplace and Poisson equations – Liebman’s iteration Process- *Determine numerical solution of ordinary differential equations and partial differential equations: Activity through software.*

L:9,T:3

TEXT BOOKS:

1. Richard A. Johnson, Irwin Miller, John Freund, Miller & Freund's, Probability and Statistics for Engineers, 9th Edition, Pearson Education Limited, Global Edition, 2017.
2. Grewal, B.S., Numerical Methods in Engineering & Science: With Programs in C, C++ & MATLAB, 10th Edition, Khanna Publishers, New Delhi, 2014.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2017.

REFERENCES:

1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia, 9th Edition, 2016.
2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, Schaum Outlines, Probability and Statistics, Tata McGraw Hill Edition, 2017.
3. Chapra, S. C and Canale, R. P. Numerical Methods for Engineers, 7th Edition, Tata McGraw - Hill, New Delhi, 2016.

L: 45; T:15; TOTAL: 60 PERIODS

Course Code	SOLID MECHANICS	L	T	P	E	C
23CE34C		3	0	2	0	4
COURSE OUTCOMES						

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: Explain the basic engineering properties of solids.

CO2: Analyze the plane truss.

CO3: Analyze the transverse loading on beams to draw shear force and bending moment diagram.

CO4: Calculate the deflection in beams and shear stresses

CO5: Determine Torsion in shafts and springs

Practical Component

CO6: Perform experiments making measurements of loads, displacements and Strains

CO7: Determination of deflection in beams experimentally.

CO8: Compute the strength of the material and stiffness properties of Structural elements

CO1: Explain the basic engineering properties of solids.

L:9, P:12

CO6: Perform experiments making measurements of loads, displacements and Strains

Rigid bodies and deformable solids – stability, strength, stiffness – *Tension, compression and shear stresses and verify experimentally*– strain, elasticity, Hooke’s law, limit of proportionality, modulus of elasticity, *Experimental verification of stress-strain behavior for steel and concrete*, lateral strain – Temperature stresses – Deformation of simple and compound bars – Shear modulus, bulk modulus, relationship between elastic constants – Biaxial state of stress – Stress at a point – Stress on inclined plane – Principal stresses and principal planes – Mohr’s circle of stresses.

CO2: Analyze the plane truss.

L:9

Stability and equilibrium of plane frames – Types of trusses – Analysis of forces in truss member’s -method of joints, method of sections, method of tension coefficients.

CO3: Analyze the transverse loading on beams to draw shear force and bending moment diagram.

L:9

Beams – Types of supports – Simple and fixed, types of load – Concentrated, uniformly distributed, uniformly varying load, combination of above loading – Relationship between bending moment and shear force – Bending moment, shear force diagram for simply supported, cantilever and over hanging beams – Theory of simple bending-Bending stress.

CO4: Calculate the deflection in beams and shear stresses

L:9, P:6

CO7: Determination of deflection in beams experimentally

Deflection of beams – Double integration method – Macaulay’s method – Slope and deflection using moment area method, Conjugate Beam method.

Conduct experiment to obtain the load deflection curve using flexure

Variation of shear stress – Shear stress distribution in rectangular, I sections, solid circular sections, hollow circular sections, angle and channel sections.

CO5: Determine Torsion in shafts and springs

L:9, P: 12

CO8: Compute the strength of the material and stiffness properties of Structural elements.

Stresses and deformation in circular shafts (solid and hollow) – *Experimental determination of modulus of rigidity using Torsion Equation*- Stepped shafts –

Shafts fixed at both ends – Leaf springs – Stresses in helical springs – *Experimental verification of deflection of springs.*

TEXT BOOKS

1. Stephen Timoshenko - Strength of Materials, CBS publishers & Distributors Pvt. Ltd, New Delhi, 2021
2. Rajput.R.K. —Strength of Materials, S.Chand and Co, New Delhi, 2021.
3. Bansal R.K. —Strength of materials, Laxmi Publications, New Delhi, 6th Edition, 2023.

REFERENCES

1. Rattan. S.S, Strength of Materials, Tata McGraw Hill Education Private Limited, New Delhi, 2017
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS–I Strength materials, Laxmi publications, New Delhi, 2018
3. Srinath, L.S. Advanced mechanics and solids, Tata-McGraw Hill Publishing Company Limited, 3rd Edition 2017.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	SURVEYING	L	T	P	E	C
23CE35C		3	0	2	0	4

COURSE OUTCOMES

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

Theory component:

CO1: Explain the basic principles and types of surveying.

CO2: Interpret the working principle and field applications of leveling.

CO3: Apply the theodolite in the field surveying.

CO4: Explain surveys for Engineering projects as per IS codes and demonstrate the EDM

CO5: Implement the concepts of remote sensing and GIS.

Practical component:

CO6: Experiment with chain and compass surveying

CO7: Perform leveling and generate contour maps.

CO8: Experiment with theodolite and measure horizontal and vertical angles

CO1: Explain the basic principles and types of surveying

L: 9, P:12

CO6: Experiment with chain, compass and plane table surveying

Survey of India - Definition - Principles - Classification - Field and office work - survey instruments, their care and adjustment -Ranging and chaining-Reciprocal ranging -Prismatic compass – Surveyor’s compass - Bearing - Systems and conversions – Local attraction- Plane table instruments and accessories- *Experimental determination of area using chain, compass and plane table*

CO2: Interpret the working principle and field applications of leveling.

L:9, P:6

CO7: Perform leveling and generate contour maps.

Leveling-Important Definitions-types of levels-Benchmarks- Temporary and permanent adjustments - Curvature and refraction - Reciprocal leveling - Longitudinal

and cross sections -*perform experiment for longitudinal and cross sectioning for construction of roads* - Plotting -Calculation of areas and volumes -Contouring - Methods - Characteristics, uses of contours and contouring by block levels-Capacity of reservoirs.

CO3: Illustrate the application of theodolite in the field surveying.

L:9, P:12

CO8: Experiment with theodolite and measure horizontal and vertical angles

Theodolite - Description and uses - Temporary and permanent adjustments of vernier transit-Types-Horizontal angles-Vertical angles-*measurement of horizontal and vertical angles experimentally using different methods*- Heights and distances-Traversing-Closing error and distribution- - Omitted measurements.- Introduction about Precise Theodolite.

CO4: Explain surveys for Engineering projects as per IS codes and demonstrate the EDM

L: 9

Surveys for engineering projects-Setting out works as per IS11134-Route Surveys as per IRC SP019 -Alignment of Tunnels as per IS 5878 -Introduction, working principles and construction of Electromagnetic distance measurement and *demonstration* – Merits and Demerits.

CO 5: Implement the remote sensing concepts and GIS Software

L:9

Definition – types – components – principles – Maps – Definitions – Map projections – types of map projections - map analysis – GIS definition – basic components – GIS Software (*demonstration*).

TEXT BOOKS:

1. Punmia.B.C., Ashok K. Jain and Arun K Jain, Surveying Vol.I, II and III, 17th Edition, Lakshmi Publications Private Limited, New Delhi, 2022.
2. Kanetkar T.P., Surveying and Levelling, Vol.I, United Book Corporation, Pune, 24th Reprint, 2022.

REFERENCES:

1. Clark D., —Plane and Geodetic Surveying, Vol.I, C.B.S. Publishers and Distributors, New Delhi, 6th Edition, Reprint, 2022.
2. James M.Anderson and Edward M.Mikhail,—Introduction to Surveying ,McGraw-Hill Book Company, 8th Edition, 2022.
3. Bannister and S.Raymond, Surveying, 8th Edition, Longman 2022.

L:45, P:30; TOTAL:75 PERIODS

Course Code	BUILDING PLANNING AND DRAWING	L	T	P	E	C
23CE36C		1	0	0	2	2

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: Explain the basic concepts of various elements of Residential / Institutional / Workshop buildings.

CO 2: Identify and practice simulation software to draw plan, elevation and sectional view of a

building.

CO 1: Explain the basic concepts of various elements of Residential / Institutional / Workshop buildings. **L:10**

Introduction to buildings, classification of buildings, building components, orientation of building, principles of architecture composition - Building Byelaws. Principles of planning of residential and public building.

CO 2: Identify and practice simulation software to draw plan, elevation and sectional view of a building. **E:20**

Experiential Learning in Peers

1. Draw developed plan, elevation, section, site plan from the given line plan for a load bearing residential building (2BHK) with stair case.
2. Plans for residential building of minimum three rooms including w/c, bath and staircase as per principles of planning.
3. Plans for public building-school building, primary health centre, restaurant, bank, post office, hostel, Function Hall and Library.
4. Draw developed plan, elevation, section, site plan from the given line plan for framed structure residential building including stair case (2BHK, G+1).

TEXT BOOKS

1. Varma B.P, —Civil Engineering Drawing & House Planning, 13th Edition, Khanna Publishers, Delhi, 2023.
2. S.S.bhavikatti,M.V.Chitawadagi -Building Planning and Drawing, IK International publishing House, 2014

REFERENCES

1. Kumaraswamy N, Kameswara Rao A, Building Planning & Drawing, 9th Edition, Charotar Publishing, 2023.
2. Shah, Kale and Patki, Building Drawing with integrated approach to Built Environment, Tata McGraw Hill, 2017.

L:15, E:30; TOTAL:45PERIODS

23GN03C	INTELLECTUAL PROPERTY RIGHTS STUDY (Common to all B.E. / B.Tech. Degree Programmes)	L	T	P	E	C
		0	0	0	4	2

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Experiential Component

- CO1: Survey and practice the basic elements of existing patents.
- CO2: Investigate and present the state of art technologies through effectual IP search.

Soft Skill Component

- CO3: Present patent survey conclusions

- CO1 Survey and practice basic elements of existing patents** **30**
Basic elements of IPR – claims – infringements – Patent examination and Report - Case studies: patent survey.
- CO2 Investigate and present the state of art technologies through effectual IP search** **30**
Importance of IP search-factors to be considered for effective IP search-Hands-on Practice

REFERENCES

1. D.P. Mittal, “Indian Patents Law and Procedure”, Taxman Publication, 2002
2. B.L. Wadera, “Patents, trademarks, copyright, Designs and Geographical Judications”, 2010
3. P. Narayanan, “Intellectual Property Law”, Eastern Law House, 2022
4. N.S. Gopalakrishnan & T.G.Agitha, “Principles of Intellectual Property”, Eastern Book Company, Lucknow, 2009.

E:60 TOTAL:60 PERIODS

Course Code	APTITUDE EXCELLENCE	L	T	P	E	C
23GN04C		0	0	2	0	1

COURSE OUTCOMES

Upon the completion of the course the students will be able to

- CO1:** Infer appropriate methods to simplify computation
- CO2:** Develop problem solving skills on Time and Work and enhance arithmetic ability
- CO3:** Interpret fundamentals in quantitative techniques and solve problems quickly
- CO4:** Improve quantitative skills and solve problems on permutation and Combination
- CO5:** Acquire the knowledge of Cognitive ability and solve puzzles effectively

CO1: Infer appropriate methods to simplify computation

Simplification: Nested Series simplification(fraction) -BODMAS rule – Viraculum (or Bar) rule – Modulus of a real number –Multiplication shortcuts -Comparing Fractions-Data Sufficiency **P:6**

CO2: Develop problem solving skills on Time and Work and enhance arithmetic ability

Time and Work: Work Done - Days from Work:- Ratio – Efficiency –Work and wages - Data Sufficiency **P:6**

CO3: Interpret fundamentals in quantitative techniques and solve problems quickly

Time Speed Distance: Body moving in the same direction- Body moving in the opposite direction-Average speed- Meeting point - Data Sufficiency **P:6**

CO4: Improve quantitative skills and solve problems on permutation and Combination

Probability Permutation Combination: Fundamental Counting Principle – Computing Permutation – Circular Permutation – Computing Combinations - Data Sufficiency **P:6**

CO5: Acquire the knowledge of Cognitive ability and solve puzzles effectively

Abstract reasoning: Mirror and water image – Figure Matrix –Pattern Completion – Logical puzzles – Dot situation - Ranking ordering. **Cognitive ability:** Blood Relation - Direction Sense Test-Data Sufficiency

P:6

REFERENCE BOOKS

1. R.V.Praveen, “Quantitative Aptitude and Reasoning”, 3rd Edition , Eastern Economy Edition, PHI Learning 2016
2. Arun Sharma,” Quantitative Aptitude for CAT”, McGraw Hill Edge, 10th Edition 2022
3. Dr.R.Aggarwal, “ Quantitative Aptitude”, S Chand Publishing, Revised Edition 2017

P:30; TOTAL: 30 PERIODS

Course Code	STRENGTH OF MATERIALS	L	T	P	E	C
23CE41C		3	0	0	0	3

COURSEOUTCOMES

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

Theory component

CO1: Apply the concept of Energy principles

CO2: Analyze indeterminate structures

CO3: Evaluate the State of stress in three dimension and failure theories

CO4: Analyze Columns and Cylinders

CO5: Analysis of beams subjected to Unsymmetrical bending, curved beams and Shear centre.

CO1: Apply the concept of Energy principles

L: 10

Strain energy and strain energy density – strain energy in traction, shear in flexure and torsion – Castigliaon’s theorem – principle of virtual work – application of energy theorems for computing deflections in beams and trusses – Maxwell’s reciprocal theorem.

CO2: Analyze indeterminate structures

L: 8

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams.

CO3: Evaluate the state of stress in three dimension and failure theories

L: 8

Determination of principal stresses and principal planes in three dimension – volumetric strain – dilatationand distortion – theories of failure – principal stress dilatation – principal strain – shear stress – strain energyand distortion energy theories

CO4: Analyze Columns and Cylinders

L: 10

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine- Gordon formula for eccentrically loaded columns – Eccentrically loaded short columns – middle third rule – core section – columns of unsymmetrical sections – (angle channel sections) – thin cylinders and shells – under internal pressure – deformation of thin cylinders and shells - thick cylinders – compound cylinders.

CO5: Analysis of beams subjected to Unsymmetrical bending, curved beams and Shear center.

L: 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – curved beams – Winkler Bach formula – stress concentration – Shear flow – Shear center.

TEXT BOOKS

1. Bansal R.K. “Strength of materials”, Laxmi Publications, New Delhi, 2022.
2. S.S.Bhavikatti, “Strength of Materials”, Vikas Publishing Company Private Limited, New Delhi, 2021.

REFERENCES

1. Hibbeler, R.C., Mechanics of Materials, Pearson, 2022
2. Dr. B. C. Punmia ,Er. Ashok Kr. Jain ,Dr.Arun Kumar Jain. “Strength of Materials, Laxmi Publishing Private Limited, New Delhi, 2019.
3. Rajput R.K. “Strength of Materials”, S.Chand & Company Limited, New Delhi, 2022.

L: 45; TOTAL: 45 PERIODS

Course Code

23CE42C

WATER SUPPLY ENGINEERING

L	T	P	E	C
3	0	0	0	3

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

- CO1: Examine the sources of water and their characteristics.
- CO2: Design the conveyance system along with the appurtenances.
- CO3: Design the suitable components of a water treatment plant.
- CO4: Demonstrate the different types of advanced water treatment processes.
- CO5: Analyze and design water distribution networks.

CO1: Examine the sources of water and their characteristics

L:9

Public water supply system - Planning - Objectives - Design period - Population forecasting -Water demand - Sources of water and their characteristics - Surface and Groundwater - Impounding reservoir well hydraulics - Development and selection of source - Water quality - Characterization-Water quality standards.

CO2: Design the conveyance system along with the appurtenances.

L:9

Water supply - intake structures - Functions and drawings - Pipes and conduits for water - Pipe materials - Hydraulics of flow in pipes - Transmission main design - Laying, jointing and testing of pipes - Drawings appurtenances - Types and capacity of pumps - Selection of pumps and pipe materials.

CO3: Design the suitable components of a water treatment plant **L:9**

Objectives - Unit operations and processes - Principles, functions of flash mixers, flocculators, sedimentation tanks, and sand filters – Disinfection - Ozonation and UV - Water softening- demineralization

CO 4: Demonstrate the different types of advanced water treatment processes. **L:9**

Aerator - Iron and manganese removal- Defluoridation - Desalination - Reverse Osmosis-membrane Systems – Construction, Operation & Maintenance aspects of Water Treatment Plants - Recent advances - Membrane Processes – Arsenic treatment.

CO5: Analyse and design water distribution network. **L:9**

Requirements of water distribution - Components - Service reservoirs - Functions and drawings - Economic way of design of Network - Computer applications - Analysis of distribution networks - Appurtenances - operation and maintenance - Leak detection-methods -principles of design of water supply in buildings - House service connection - Fixtures and fittings - Systems of plumbing and drawings of types of plumbing.

TEXT BOOKS

1. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2018
2. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2018
3. Duggal K.N., “Elements of Environmental Engineering” S.Chand and Co. Ltd., New Delhi, 2014.

REFERENCES

1. Punmia B.C, Ashok Jain and Arun Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2016.
2. Gray N.F, “Water Technology”, Elsevier India Pvt. Ltd. New Delhi, 2006.
3. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2023.

L: 45; TOTAL: 45 PERIODS

Course Code	HYDRAULICS AND HYDRAULIC	L	T	P	E	C
23CE43C	MACHINES	3	0	2	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

CO1: Apply the concepts of open channel flow and design the economical Section

CO2: Analyze the flow measurement and specific energy

CO3: Analyze the varied channel-flow and dam flow profile characteristics

CO4: Evaluate the performance characteristics of various types of turbines

CO5: Demonstrate the different types of pumps for various Engineering applications

Practical Component

CO6: Evaluate the co-efficient of discharge for notches (Rectangular, Triangular)

CO7: Determine the impact of jet on Vanes (flat / inclined/curved)

CO8: Evaluate the efficiency of Pumps

CO9: Evaluate the efficiency of Turbines

- CO1: Apply the concepts of open channel flow and design the economical Section** L:10
Definition and differences between pipe flow and open channel flow - classification of Flow in channels - Properties of open channel - Velocity distribution in open channel — Discharge through Manning's and Chezy's formula –Most economical sections of channels.
- CO2: Analyze the flow measurement and specific energy** L:8,
CO6: Evaluate the co-efficient of discharge for notches (Rectangular, Triangular) P:3
Flow measurement by notches and weirs – Specific energy– Determination of normal depth and velocity - Critical flow and its computation – application of specific energy and discharge diagrams to Channel Transition.
- CO3: Analyze the rapidly varied channel-flow and dam flow profile characteristics** L:10
Non-Uniform flow through open channel - Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Hydraulic jump – Location of hydraulic jump.
- CO4: Evaluate the performance characteristics of various types of turbines** L:9,
CO7: Determine the impact of jet on Vanes(flat / inclined/curved) P:12
Impact of jets on plane and curved plates - Classification of Turbines – Selection of turbine – Impulse turbine – Radial flow Reaction turbines - Francis turbine - draft tube – Axial flow reaction turbine - Propeller and Kaplan turbine – Specific speed of turbine.
- CO5: Demonstrate the different types of pumps for various Engineering applications** L:8,
CO8: Evaluate the efficiency of Hydraulic machines (Pumps & Turbines) P:15
Classification of Pumps - Centrifugal pump - Work done – Multistage centrifugal pump – NPSH - Specific speed of pump - Characteristics curve - reciprocating pump – negative slip - flow separation conditions - air vessels - indicator diagram

TEXT BOOKS

1. Bansal R.K, Fluid mechanics & Hydraulic machines, Laxmi Publishing Private Limited, New Delhi, 11th Edition, 2024.
2. Modi, P.N & Seth, S.M “Hydraulics and fluid Mechanics”, Standard book house, New Delhi, 21st Edition, 2017.
3. Yunus A. Cengel , John M. Cimbala , Fluid Mechanics: Fundamentals and Applications, Tata McGraw Hill Education Private Limited, New Delhi, 4th Edition, 2017 .

REFERENCES

1. Jain A.K., “Fluid Mechanics including Hydraulic Machines”, Khanna Publishers, New Delhi, 2016.
2. Ramamrutham S, Hydraulics Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, 9th Edition, 2014
3. Subramanya.K; Fluid Mechanics and Hydraulic Machines; Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2018

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	CONCRETE TECHNOLOGY	L	T	P	E	C
23CE44C		3	0	2	0	4

COURSE OUTCOMES

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

Theory Component

CO1: Describe the requirements of cement, aggregates, and water for concrete

CO2: Select suitable admixtures for enhancing the properties of concrete

CO3: Design concrete mixes as per IS method of mix design

CO4: Determine the properties of concrete in fresh and hardened states.

CO5: Manufacture the special concretes for specific requirements.

Practical Component

CO6: Determine the physical properties of cement

CO7: Determine the physical properties of aggregates

CO8: Determine the workability and mechanical properties of concrete

CO1: Understand the requirements of cement, aggregates, and water for concrete **L: 9,**

CO6: Determine the physical properties of cement **P: 20**

CO7: Determine the physical properties of aggregates

Cement-Different types - Chemical composition and Properties - Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements - Water- Quality of water for use in concrete

TESTS ON CEMENT - Determination of fineness of cement, specific gravity of cement, consistency of cement, and initial and final setting time of cement .TEST ON FINE AGGREGATE - Determination of specific gravity and water absorption of fine aggregate and grading of fine aggregate. TEST ON COARSE AGGREGATE - Determination of compacted and loose bulk density of coarse aggregate, impact value of coarse aggregate, elongation index of coarse aggregate, flakiness index of coarse aggregate, crushing value of coarse aggregate and specific gravity of coarse aggregate

CO2: Select suitable admixtures for enhancing the properties of concrete **L:9**

Accelerators-Retarders- Plasticisers- Super plasticizers- Waterproofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag, and Metakaolin - Effects of admixtures on concrete properties

CO3: Design concrete mixes as per IS method of mix design **L:9**

Principles of Mix Proportioning- Properties of Concrete Related to Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples.

CO4: Determine the properties of concrete at fresh and hardened state **L: 9,**

CO8: Determine the workability and mechanical strength of concrete **P: 20**

Workability - Segregation and Bleeding – Relationship between water-cement ratio and strength of concrete

- Compressive and Flexural strength requirements as per BIS - Properties of Hardened

concrete- Stress- strain curve for concrete - Modulus of elasticity. TEST ON CONCRETE - Determination of slump of concrete, compressive strength of concrete, flexural strength of concrete and modulus of elasticity

CO5: Manufacture the special concretes for specific requirements **L:9**

High-strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - Shotcrete – Polymer concrete - High-performance concrete- self-compacting concrete - Geopolymer Concrete.

TEXTBOOKS

1. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2022.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2019

REFERENCES

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2018
2. Gambhir.M.L, Concrete Technology, Fifth Edition, McGraw Hill Education, 2017.
3. Job Thomas, Concrete Technology, Cengage Learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, NewDelhi.

L: 45, P: 30; TOTAL: 75 PERIODS

Course Code	SOIL MECHANICS	L	T	P	E	C
23CE45C		3	0	2	0	4

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to

Theory Component

Upon completion of this course, the students will be able to

CO1: Compute the index properties of soil and classify soil according to the IS Classification system.

CO2: Discuss the principle of soil water movement and its effect on stress distribution

CO3: Evaluate the Vertical stresses and compute compaction and consolidation characteristics of soil

CO4: Determine the shear strength parameters of soil

CO5: Analyze the Slope Stability of Soil

Practical Component

CO6: Demonstrate the basic index properties of soil and prepare a soil report based on the IS Classificationsystem.

CO7: Perform Experiments to determine the coefficient of permeability of cohesionless soil and cohesivesoil.

CO8: Demonstrate the experiment to ascertain the compaction characteristics and coefficient of

consolidation of soil.

CO9: Perform Experiments to determine shear strength parameters of soil.

CO1: Compute the basic index properties of soil and classify soil according to the IS Classification system. L:10, P:12

CO6: Demonstrate the basic index properties of soil and prepare a soil report based on the IS Classification system.

Nature of Soil - Problems with soil - phase relation -Index properties – clay mineralogy structural arrangement of grains - sieve analysis - sedimentation analysis – Atterberg's limits - Classification for engineering purposes - BIS Classification system.

CO2: Discuss the principle of soil water movement and its effect on stress distribution L:9,

CO7: Perform Experiments to determine the coefficient of permeability of cohesionless soil and cohesive soil. P:4

Soil water – Various forms – Capillary rise – Suction - Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy's Law- Permeability measurement in the laboratory – field measurement pumping out in unconfined and confined aquifer - Quick sand condition - Seepage - Introduction to flow nets.

CO3: Evaluate the Vertical stresses and compute compaction and consolidation characteristics of soil L:10, P:6

CO8: Demonstrate the experiment to ascertain the compaction characteristics and coefficient of consolidation of soil.

Stress distribution in soil media – Boussinesque formula – Stress due to line load and Circular and rectangular loaded area - Approximate methods - Use of influence charts - Soil compaction - factors affecting compaction – Field compaction methods-Components of settlement - Terzaghi's one dimensional consolidation theory - Laboratory consolidation test – Computation of rate of settlement – consolidation settlement.

CO4: Determine the shear strength parameters of soil L:9,

CO9: Perform Experiments to determine shear strength parameters of soil P:8

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil- Liquefaction of sand.

CO5: Analyze the Slope Stability of Soil L:7

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Method of slices – Modified Bishop's method - Friction circle method - Stability number – Problems – Slope protection measures.

TEXT BOOKS

1. Punmia, B.C., Soil Mechanics and Foundations, Laxmi Publications Private Limited, 18th Edition, 2023.
2. Arora, K.R, Soil Mechanics and Foundation Engineering, Standard Publishers, 7th Edition, 2020(Reprint).

REFERENCES

1. Craig.R.F., Soil Mechanics, Spon Press E & F N, London and New York, 9th Edition, 2019.
2. Gopal Ranjan, A S R Rao, —Basic and Applied Soil Mechanics, New Age International Publication, 4th Edition, 2022.
3. Murthy, V.N.S., Text book of Soil Mechanics and Foundation Engineering, CBS Publishers Distribution Limited., New Delhi, 2018.
4. Palanikumar.M., Soil Mechanics, Prentice Hall of India, Learning Private Limited Delhi, 2013.

L: 45; P: 30; TOTAL: 75 PERIODS

23MC01C	CONSTITUTION OF INDIA	L	T	P	E	C
		2	0	0	0	0

COURSE OUTCOMES

Upon completion of this course, the students will be able to

- CO1:** Describe the salient features of the Indian Constitution.
- CO2:** Discuss the structure and functions of parliament.
- CO3:** Elaborate the structure and functions of state legislature.
- CO4:** Explain the fundamentals of organization and working of the Judiciary.
- CO5:** Discuss the foreign policy of India.

CO1: Describe the salient features of the Indian Constitution Salient Features – Preamble-Pillars of constitution - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties.	6
CO2: Discuss the structure and functions of parliament Powers and Functions of President and Prime Minister - Council of Ministers – The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker.	6
CO3: Elaborate the structure and functions of state legislature Features of Federal System - Administrative Relationship between Union and States - Powers and Functions of Governor and Chief Minister – Council of Ministers –State Legislature.	6
CO4: Explain the fundamentals of organization and working of the Judiciary Organization and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.	6
CO5: Discuss the foreign policy of India Foreign Policy of India – VISA Application Process- International Institutions like UNO, WTO, SAARC and Environmentalism.	6

TEXT BOOKS

1. Basu D.D,” Introduction to Indian Constitution”, Prentice Hall of India, 2015.
2. Gupta D.C, “Indian Government and Politics”, Vikas Publishing House, 2010.

REFERENCES

1. Pylee M.V, “Introduction to the Constitution of India”, Vikas Publishing House, 2011.
2. Kashyap S, “Our Constitution”, National Book Trust, 2010.
3. Shukla V N, “Constitution of India”, Eastern Book Company Ltd., 2011.

L: 30; TOTAL: 30 PERIODS

