



**SRI VENKATESWARA COLLEGE OF ENGINEERING,**  
(An Autonomous Institution, Affiliated to Anna University, Chennai – 600025)



# **B.E., Marine Engineering**

***CURRICULUM AND SYLLABUS***

***REGULATION – 2022***

***CHOICE BASED CREDIT SYSTEM***

(This course and syllabus are prescribed as per the directives of the Directorate General of Shipping,  
Government of India in-compliance with STCW 2010)

# SRI VENKATESWARA COLLEGE OF ENGINEERING,

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REGULATIONS 2022

## B. E. MARINE ENGINEERING

CHOICE BASED CREDIT SYSTEM

### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. To nurture academically sound, disciplined and competent marine engineers.
2. To provide opportunity for students to work as part of teams on multidisciplinary projects or companies
3. To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies.

### PROGRAM OUTCOMES (POs)

#### PO GRADUATE ATTRIBUTES

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** 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.
5. **Modern tool usage:** 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.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### PROGRAM SPECIFIC OUTCOMES (PSOs)

13. To facilitate the students to continuously upgrade their technical competency as mandated by IMO (International Maritime Organization).
14. To meet the STCW (Standards of Training, Certification & Watch-keeping) requirements as amended from time to time.
15. To create awareness among the students to continuously contribute towards the societal betterment and protection of global environment.

### PEO's – PO's& PSO's MAPPING:

POs	PEOs		
	I	II	III
1.			✓
2.			✓
3.			✓
4.			✓
5.			✓
6.	✓	✓	
7.	✓		
8.	✓		
9.		✓	
10.		✓	
11.		✓	✓
12.	✓		✓
13.	✓		
14.	✓		
15.		✓	

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**REGULATIONS 2022**  
**CHOICE BASED CREDIT SYSTEM**

**B. E. MARINE ENGINEERING**

**CURRICULUM AND SYLLABUS FOR SEMESTERS I AND II**

(This course and syllabus are prescribed as per the directives of the Directorate General of Shipping, Government of India in-compliance with STCW 2010)

**SEMESTER I**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
1.	IP22151	Induction Program (Common to all branches)		--	--	--	--	--	Nil	
<b>Theory Subjects</b>										
2.	HS22151	Tamil language and Heritage of Ancient Tamil Society (Common to all branches)	HS	1	0	0	1	1	Nil	
3.	HS22152	Communicative English (Common to all branches)	HS	3	0	0	3	3	Nil	
4.	MA22152	Applied Mathematics I for Marine Engineers	BS	3	1	0	4	4	Nil	
5.	PH22152	Engineering Physics (Common to AE, CE, ME, MN, MR)	BS	3	0	0	3	3	Nil	
6.	CY22154	Chemistry for Marine Engineering	BS	3	0	0	3	3	Nil	
7.	ME22101	Engineering Drawing (Common to ME, MN, MR)	ES	1	0	4	3	5	Nil	
8.	MR22101	Introduction to Marine Engineering	PC	3	0	0	3	3	Nil	
<b>Practical Subjects</b>										
9.	CY22161	Chemistry Laboratory (Common to all branches except AD, CS, IT)	BS	0	0	2	1	2	Nil	
10.	MR22111	Fitting Workshop	ES	0	0	4	2	4	Nil	
<b>Total</b>				<b>18</b>	<b>1</b>	<b>8</b>	<b>23</b>	<b>28</b>		

# Ideally a semester contains 15 weeks

**SEMESTER II**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
<b>Theory Subjects</b>										
1.	HS22251	Science and Technology in Ancient Tamil Society <i>(Common to all Branches)</i>	HS	2	0	0	2	2	Nil	
2.	HS22252	Technical English <i>(Common to all branches)</i>	HS	3	0	0	3	3	Nil	
3.	MA22252	Applied Mathematics II for Marine Engineers	BS	3	1	0	4	4	Nil	
4.	MR22202	Material Science and Engineering	ES	3	0	0	3	3	Nil	
5.	ME22201	Engineering Mechanics <i>(Common to ME, MN and MR)</i>	ES	3	0	0	3	3	Nil	
6.	IT22252	Computer Applications and Python programming	ES	2	0	2	3	4	Nil	
7.	MR22201	Thermal Engineering for Marine Engineers	PC	3	0	0	3	3	Nil	
8.	EE22151	Basic Electrical and Electronics Engineering <i>(Common to all branches except CH, EE and EC)</i>	ES	3	0	0	3	3	Nil	
<b>Practical Subjects</b>										
9.	MR22211	Computer Aided Drafting Laboratory	ES	0	0	2	1	2	Nil	
10.	EE22111	Basic Electrical and Electronics Laboratory <i>(Common to all branches except EC)</i>	ES	0	0	2	1	2	Nil	
11.	PH22161	Physics Laboratory <i>(Common to all branches except BT)</i>	BS	0	0	2	1	2	Nil	
<b>Total</b>				<b>22</b>	<b>1</b>	<b>8</b>	<b>27</b>	<b>31</b>		

# Ideally a semester contains 15 weeks



# ***Semester I***

HS22151

தமிழ் மொழியும் தமிழர் மரபும்  
Tamil Language and Heritage of Tamils  
(Common to all branches)

L T P C  
1 0 0 1

பாடத்தின் நோக்கங்கள் :

1. தமிழ் மொழியின் தோற்றம் பற்றியும், திணை கருத்துக்கள் வாயிலாக வாழ்வியல் முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.
2. இந்திய தேசிய சுதந்திர இயக்கத்தில் தமிழர்களின் பங்களிப்பு மற்றும் தமிழர்களின் மேலாண்மை முறைகளை பற்றியும் கற்றுக் கொள்வார்கள்.

**Course Objectives :**

1. They will learn about the origin of the Tamil language and the ways of life through five types of lands.
2. They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

**அலகு 1 தமிழுக்கும் தொழில் நுட்ப கல்விக்கும் உள்ள தொடர்பு 3**

மொழி மற்றும் பாரம்பரியம்: இந்தியாவில் உள்ள மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - உ.வே.வின் பங்களிப்பு. சாமிநாதய்யர். ஆறுமுக நாவலர் - தொழில்நுட்பக் கல்வியில் தமிழ் மொழியின் முக்கியத்துவம்.

**UNIT -1 LANGUAGE AND HERITAGE**

Language families in india – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U. Ve. Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

**அலகு 2 திணை கருத்துக்கள் 9**

திணை கருத்துக்கள்: -ஐந்து வகை நிலங்கள், விலங்குகள், கடவுள்கள், தொழில், வாழ்க்கை முறைகள், இசை, நடனம், உணவு முறை, தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள் - தொல்காப்பியம் மற்றும் சங்க இலக்கியங்களில் இருந்து அகம் மற்றும் புரம் கருத்து - தமிழ் பற்றிய அறம் கருத்து - கல்வி மற்றும் எழுத்தறிவு சங்க காலம் - சங்க காலத்தின் பண்டைய நகரங்கள் மற்றும் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - சோழர்களின் வெளிநாட்டு வெற்றி.

**UNIT -2 THINAI CONCEPTS**

Five types of lands, animals, Gods, occupation, life styles, music, dance , food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Choloas.

**அலகு 3 தமிழரின் மரபு 3**

இந்திய தேசிய சுதந்திர இயக்கம் மற்றும் இந்திய கலாச்சாரத்திற்கு தமிழர்களின் பங்களிப்பு:- சுப்ரமணிய பாரதி, வாஞ்சிநாதன், சுப்பிரமணிய சிவா, வீரபாண்டிய கட்டபொம்மன், வா. ஊ. சிதம்பரம் பிள்ளை, தீரன் சின்னமலை, மருது பாண்டிய சகோதரர்கள், பூலி தேவர், திருப்பூர் குமரன், வீர மங்கை வேலுநாச்சியார் - தமிழர் இலக்கியங்களில் மேலாண்மை கருத்துக்கள் (கி. மு. 500 முதல் கி. பி 200 வரை) – அகநானூறு, புறநானூறு, திருக்குறள் ஆகியவற்றில் மேலாண்மைக் கருத்துக்கள்..

**UNIT -3 HERITAGE OF TAMILS**

Contribution of Tamils to Indian National Freedom Movement and Indian Culture : Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar.

பாடநெறி முடிவுகள் :படிப்பை வெற்றிகரமாக முடித்தவுடன், மாணவர்கள் பின்வருவனவற்றைச் செய்ய முடியும்.

**COURSE OUTCOMES :** On completion of the course, the student will be able to

பா.வெ. எண் CO No	பாடத்திட்டத்தின் வெளிப்பாடு Course Outcomes	RBT level
1	மாணவர்கள் தமிழ் மொழி தோற்றம் பற்றி தெரிந்து கொள்வார்கள். Students will learn about the origin of the Tamil language	1
2	தமிழர்களின் வாழ்வியல் முறைகளை தெரிந்து கொள்வார்கள். They will know the ways of life of Tamils.	2
3	தமிழர்களின் சுதந்திர போராட்ட வீரர்களை பற்றியும், மேலாண்மைகளை பற்றியும் தெரிந்து கொள்வார்கள். They will know about the freedom fighters of Tamils and the management of Tamils	2

**பாட நூல்கள்:**

பொன். முத்துகுமாரன் (2002), "தமிழ் மரபு", காந்தளகம், 68, அண்ணா சாலை, சென்னை 600 002

பி. டி ஸ்ரீனிவாச ஐயங்கார் (தமிழ்க்கமும் திறனாய்வும்) புலவர் கா. கோவிந்தன் (1988), "தமிழர் வரலாறு (முதல் பகுதி)", திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்பு கழகம் ,154, TTK சாலை, சென்னை 18.

டாக்டர் கே கே பிள்ளை (2009), "தமிழக வரலாறு மக்களும் பண்பாடும்", உலக தமிழாராய்ச்சி நிறுவனம், தரமணி , சென்னை 600113

முனைவர். ச. இராஜேந்திரன் (2004), "தமிழில் சொல்லாக்கம்", தஞ்சாவூர் தமிழ் பல்கலைக் கழகம் வெளியீடு



L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. Enable learners to interact fluently on everyday social contexts.
2. Train learners to engage in conversations in an academic/scholarly setting.
3. Instil confidence in learners to overcome public speaking barriers.
4. Develop learners' ability to take notes and in the process, improve their listening skills
5. Enhance learners' reading skill through reading text passages for comprehension and contemplation.
6. Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

**UNIT I****9 Hours**

Listening - short video clips - conversational scenes from movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

**UNIT II****9 Hours**

Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

**UNIT III****9 Hours**

Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking - language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

**UNIT IV****9 Hours**

Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product, movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar – Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

## UNIT V

9 Hours

Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

**TOTAL: 45 PERIODS**

### REFERENCES:

1. Department of English, Anna University, Mindscapes : English for Technologists and Engineers. Orient Black Swan, Chennai, 2017.
2. Downes and Cambridge English for Job-hunting, Cambridge University Press, New Delhi, 2008.
3. Murphy and Raymond, & quot;Intermediate English Grammar with Answers, Cambridge University Press, 2000.
4. Thomson, A.J., & ;Practical English Grammar, Oxford, 1986.

### Websites

1. <http://www.usingenglish.com>
2. <http://www.uefap.com>
3. <https://owl.english.purdue.edu/owl/>
4. [www.learnenglishfeelgood.com/esl-printables-worksheets.html](http://www.learnenglishfeelgood.com/esl-printables-worksheets.html)

### Software

1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University Press 2017.
4. Official Guide to the TOEFL Test With CD-ROM, 4<sup>th</sup> Edition.
5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

### OUTCOMES:

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

CO No.	CO Statements	RBT LEVEL
1	Acquire adequate vocabulary for effective communication	3
2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	3
3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	4
4	Comprehend conversations and short talks delivered in English.	6
5	Write short write-ups and personal letters and emails in English	6

**COURSE ARTICULATION MATRIX**

CO	Pos														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.										3					
2.										3					
3.										3					
4.										3					
5.										3					

**3** means ‘a strong correlation’ as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in formal and informal environment.



L	T	P	C
3	1	0	4

**COURSE OBJECTIVES:**

The Student should be made to:

1. Understand the concepts of three-dimensional analytic geometry.
2. Acquire the concepts of differential calculus which are widely used in marine engineering problems.
3. Compute derivatives using the chain rule or total differentials
4. Study geometry integrals and its applications to relevant engineering problems.
5. Acquire knowledge mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I THREE DIMENSIONAL ANALYTICAL GEOMETRY (9+3)**

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

**UNIT II DIFFERENTIAL CALCULUS (9+3)**

Differentiation of algebraic, circular, exponential and logarithmic functions, of products, quotient functions of a function and simple implicit functions. Successive differentiation- intro. And notation, nth order derivatives of standard functions, nth order derivatives using (a) trig. identities and standard functions (b) partial fractions, Leibnitz theorem, Maclaurin's Theorem, and standard expansions, Expansions using standard expansions, Taylor's theorem, Indeterminate forms and L'Hospital's rule, Curve tracing of Cartesian and polar curves.

**UNIT III FUNCTIONS OF SEVERAL VARIABLES (9+3)**

Limits and continuity, Partial derivatives – definition, geometrical interpretation and rules of partial differentiation, Higher order partial derivatives, Homogeneous functions, Euler's theorem for homogenous functions – Total derivatives and chain rules, Differentiation of implicit functions and composite functions, Errors and approximations, Maxima and Minima, Method of Lagrangian multipliers.

**UNIT IV INTEGRAL CALCULUS (9+3)**

Integration of standard forms by substitution and by parts. The definite integral as the limit of a sum. Application of integration to area under curve; volume of revolution; First moment of area and the position of a centroid of an area; Work done by variable forces; mean values, Root mean square values of  $\sin x$  and  $\cos x$ . The rules of Guldinus. Theorems of parallel and perpendicular axes. Second moments of area and moments of inertia of a rectangular and circular laminas.

**UNIT V MULTIPLE INTEGRALS (9+3)**

Double and triple integrals – Cartesian coordinates- Region of integration and change of order of integration, Spherical polar and cylindrical coordinates Theorems of parallel and perpendicular axes. Second moments of area and moments of inertia of a rectangular and circular laminas Applications- Area, Volume, Mass of wire, lamina and solid. Centre of Gravity of wire, lamina and solid. Moment of Inertia using multiple integrals..

**TOTAL (L:45+T:15):60 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Apply the basic concepts of analytical geometry in marine engineering problems.	3
2	Apply the basic notion of calculus to engineering problems and to tackle different geometries.	3
3	Perform calculus for more than one variable and its applications in engineering problems.	3
4	Perform integration to compute arc lengths, volumes of revolution and surface areas of revolution.	3
5	Apply integration to compute multiple integrals, area, moment of inertia, integrals in polar coordinates, in addition to change of order	3

**TEXT BOOKS:**

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S “Higher Engineering Mathematics”, 43<sup>rd</sup> Edition, Khanna Publications, Delhi, (2015).
3. William Embleton and Leslie Jackson, “Mathematics for Engineers Vol- I”, 7th Edition.

**REFERENCES:**

1. Jain R.K and Iyengar S.R.K,” Advanced Engineering Mathematics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., 2007.
2. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, 9<sup>th</sup> edition, Laxmi Publications(p) Ltd., 2014.
3. Reed’s Marine Engineering Series, Thomas Reed Publications, 1997.

**WEB LINK:**

1. <https://home.iitm.ac.in/asingh/papers/classnotes-ma1101.pdf>
2. <http://nitkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf>

**COURSE ARTICULATION MATRIX**

COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3										3			
2.	3	3	3	3								3			
3.	3	3	3	3								3			
4.	3	3										3			
5.	3	3	2	2								3			

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering.

**UNIT I MECHANICS****9**

Moment of inertia (M.I) - Radius of gyration - Theorems of M. I - M.I of circular disc, solid cylinder, hollow cylinder, solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic molecule – Rotational energy state of a rigid diatomic molecule - centre of mass – conservation of linear momentum – Relation between Torque and angular momentum - Torsional pendulum.

**UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS****9**

**Fluid** – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers-forces on planes – centre of pressure – buoyancy and floatation.

Modes of heat transfer- thermal conductivity- Newton’s law of cooling - Linear heat flow – Lee’s disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel)

**UNIT III ACOUSTICS AND ULTRASONICS****9**

Classification of Sound- decibel- Weber–Fechner law – Sabine’s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting Acoustics of buildings and their remedies. Production of Ultrasonics by Magnetostriction and Piezoelectric methods -

Acoustic grating -Non-Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays, medical applications – Sonogram.

**UNIT-IV: PHOTONICS AND FIBER OPTICS****9**

**Photonics:** population of energy levels, Einstein’s A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO<sub>2</sub> Laser – Applications. **Fiber optics:** principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication-fibre optic sensors: pressure and displacement- Endoscope.

## UNIT V: CRYSTAL PHYSICS

9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances- coordination number and packing factor for SC, BCC, FCC, HCP and diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults

### TEXTBOOKS:

1. Gaur R.K. and Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2. Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
- 3 Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
- 4 Arumugam M, "Materials Science", Anuradha Publications, 2015.

### REFERENCES:

1. David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley, 2015.
2. Peter Atkins and Julio De Paula, "Physical Chemistry", 10th Edition, Oxford University Press, 2014.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S, "Concepts of Modern Physics", 7<sup>th</sup> Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010

### Course outcomes

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Gain knowledge in Mechanics	2
2	Evaluate the concepts of properties of matter and thermal physics	3
3	Learn to solve the issues related to defects in the buildings due to acoustic design and the significance of ultrasonic waves	3
4	Develop an understanding of photonics and Fiber Optic communication system	2
5	Classify and demonstrate the fundamentals of crystals and their defects.	3

### COURSE ARTICULATION MATRIX

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	2		2						1					
2.	3	2		2						1		2			
3.	3		2		3	2	1			1					
4.	3		2		3	2	1			1		2			
5.	3	2	2							1					

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

On completion of the course the students are expected to;

6. Have a thorough knowledge of water chemistry and feed water treatment methods.
7. Have a knowledge of various water analysis procedures
8. To study the basic principles of corrosion and its control
9. Have a basic concept on nanochemistry and energy sources and storage devices.

**UNIT I WATER TECHNOLOGY 09**

Water its sources, classification and types of impurities – significance of impurities such as turbidity, colour, acidity, alkalinity, hardness, chlorides, sulphates, iron and manganese, DO, BOD, COD. Impurities in fresh water, sea water, distilled water. Boiler feed water- Introduction and requirements, purpose of water treatment in boilers, scale and sludge - causes, effects and prevention.

**UNIT II WATER TESTING 09**

Hardness, disadvantages of hard water in domestic field, industrial field, estimation of hardness by EDTA method, treatment for hardness (internal and external conditioning methods), total dissolved solids, dissolved oxygen test, test for partial and total alkalinity, chloride, sulphite, phosphate test, salinometer and its uses, use of litmus paper, typical test values for smoke and water tube boilers.

**UNIT III WATER TREATMENT 09**

Lime and Soda treatment – Hot lime and cold lime soda process, pH treatment, use of coagulants, caustic soda treatment, condensate line treatment, Demineralization, Zeolite process, Desalination of water - reverse osmosis and electro-dialysis, priming, foaming and control, effects of salts and gases in feed water, domestic water treatment – primary treatment and disinfection (UV, ozonation, chlorination and breakpoint chlorination)

**UNIT IV CHEMISTRY OF CORROSION & ITS CONTROL 09**

Introduction – Dry or chemical corrosion – mechanism, Pilling Bed worth rule, Wet or Electrochemical corrosion -mechanism – fretting, pitting corrosion, corrosion fatigue, types and causes of corrosion, dezincification and stress corrosion, factors influencing corrosion, Corrosion control - methods of mechanical and chemical de-aeration - material selection and design, sacrificial anodic protection, impressed current cathodic protection, Protective coatings – galvanizing, tinning, electroplating and paints.

**UNIT V NANOCHEMISTRY AND ENERGY SOURCES 09**

Introduction – Distinction between molecules, nanomaterials and bulk materials, size dependent properties, properties of nanoparticles, nanoclusters, nano rods and carbon nano tubes. Synthesis of nanomaterials – chemical vapour deposition and laser ablation method - applications of nanomaterials in medicine, agriculture, electronics, fuel cells and catalysis, Batteries- primary battery (dry cell) secondary batteries – alkaline batteries – lead acid, Ni-Cd and Li batteries, principles and applications of solar cells, wind energy, hydrogen and oxygen- fuel cell and next generation batteries

**TOTAL: 45 PERIODS**



**COURSE OUTCOMES:**

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

CO No	CO Statements	RBT Level
1	Classify the various sources and possible impurities of water and the purpose of feed water treatment for boilers	2
2	Describe the concepts of boiler corrosion, their types, causes and corrosion control techniques.	3
3	Illustrate the various boiler water treatment methods.	2
4	Explain the concept of hardness, its types and removal methods, also estimate the hardness present in a water sample.	2
5	Discuss about energy sources, Nano chemistry and its significance.	2

**TEXT BOOKS:**

1. Jain P.C. and Monika Jain, Engineering Chemistry, 4th Edition, Dhanpat Rai & Sons, New Delhi, 2010.
2. Milton and Leech, "Marine Boilers" Butter worth Publishers, UK 1980.

**REFERENCES:**

1. Uppal M.M., A Textbook of Engineering Chemistry, 7th Editions, Khanna Publishing, 1988.
2. Skelly J.D., "Water treatment" Imarest Publication, London, 2004.
3. Jackson. L, Morton. TD, "Reed's General Engineering Knowledge for Marine Engineers", Bloomsbury USA, 2010.

At the end of the course, add the course articulation matrix as per the following format:

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3				3									
2.	3	3										2			
3.	3											2			
4.	3	3	2			3									
5.	3		2			3	1								

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

ME22101

**ENGINEERING DRAWING**  
**(Common to ME, MN, MR)**

L	T	P	C
2	0	2	3

**OBJECTIVES :**

- This course will introduce the students to build their ability to read drawings and interpret the position and form of simple geometries.

**UNIT 0                    CONCEPTS AND CONVENTIONS AND GEOMETRIC CONSTRUCTION (NOT FOR EXAM)                    2**

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons.

**UNIT I                    CYCLOIDAL CURVES, INVOLUTE AND PROJECTIONS OF POINTS, LINES                    10**

Basic construction of cycloid, epicycloid and hypocycloid - Drawing of tangents and normal to the above curves. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

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

**UNIT II                    PROJECTIONS OF PLANES AND PROJECTIONS OF SOLIDS                    12**

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

Projections of regular solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

**UNIT III                    SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES                    12**

Sectioning of regular solids like prisms, pyramids, cylinder and cone in vertical position when the section plane is inclined to one of the principal planes and perpendicular to the other - Drawing of sectional front and top views and true shape of section.

Development of surfaces of simple and sectioned solids - prisms, pyramids cylinders and cones.

**UNIT IV                    ISOMETRIC PROJECTION AND INTERSECTION OF SURFACES                    12**

Introduction to Pictorial Projection - Principles of isometric projection - Isometric scale - Isometric projection of regular solids (prisms, pyramids, cylinder, cone), truncated solids and their combination in vertical position.

Line of intersection - Determining the line of intersection between surfaces of two interpenetrating solids with axes of the solids intersecting each other perpendicularly, using line method - Intersection of two square prisms and intersection of two cylinders are only to be considered

**UNIT V                    FREE-HAND SKETCHING                    12**

Free-hand sketching – Sketching procedures – Steps in sketching - Orthographic views (front, top and side views) of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views (front, top and side views)

**TOTAL : 60 (30 L+30P) PERIODS**

**OUTCOMES :** On completion of the course, the student will be able to

CO No	CO statements	RBT level
1	<b>Construct</b> conic sections and curves and sketch the orthographic views of lines as per drawing standards	3
2	<b>Draw</b> orthographic projections of plane surfaces and simple solids in various positions	3
3	<b>Draw</b> the various views of sectioned solids and develop the lateral surfaces of simple solids.	3
4	<b>Draw</b> isometric projections of simple solids and their combinations and the orthographic projection of the intersection of surfaces of simple solids.	3
5	<b>Sketch</b> the orthographic projections of a given isometric view and vice versa using free hand.	3

**TEXT BOOKS:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
3. Venugopal K. and Prabhu Raja V., “Engineering Drawing+AutoCAD”, New Age International (P) Limited, 6<sup>th</sup> edition, 2022

**REFERENCES :**

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill, 2nd Edition, 2019.
2. Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education India, 2nd Edition, 2009.

**WEB RESOURCES:**

1. <https://nptel.ac.in/courses/112105294>
2. <https://nptel.ac.in/courses/112103019>

**COURSE ARTICULATION MATRIX**

COs	PROGRAM OUTCOMES												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1										1						
CO2										2						
CO3										2						
CO4										3						
CO5										3						

1- Weak, 2 – Moderate, 3 - Strong

**COURSE OBJECTIVES:**

1. To impart knowledge on marine power plants.
2. To give an overview of Marine auxiliary machines to the students
3. To make students understand the functioning of the Marine refrigeration system.
4. To make students aware of the air-conditioning system and processes.
5. To impart knowledge on HVAC Components and Reefer containers

**UNIT I MARINE POWER PLANTS****9**

Introduction to Marine Power Plants – Diesel Engine – 2 stroke & 4 stroke engines, Steam turbine, gas turbine, nuclear power plant, major components and principle of working, selection of the type of plant, advantages of co-generation & Combined power plant cycles, Environmental impact of power generation using fossil fuels and nuclear energy.

**UNIT II INTRODUCTION TO MARINE AUXILIARY MACHINERY****11**

Overview of Marine Auxiliary Machines, Air compressor - principle, types and importance of compressed air, Principle and importance of Fuel oil and Lubricating oil purifiers – Various types of pumps and their application – Various types of heat exchangers, Various of types of valves and application, Types of packing materials for exhaust gas, steam, fuel oil, lubricating oil, water, chemicals, refrigerants, piping systems.

**UNIT III MARINE REFRIGERATION****8**

Typical marine refrigerating plants with multiple evaporator systems – construction and operation, starting and stopping of Marine refrigeration plant, safety measures in refrigeration plants, refrigerant charging procedure. Refrigeration in Liquefied gas carriers

**UNIT IV MARINE AIR CONDITIONING****8**

Psychrometry and Principles of Air conditioning – Comfort conditions - Typical marine Air conditioning and Ventilation system – construction and working, Starting and stopping procedure for Marine Air-conditioning plant, Maintenance & Troubleshooting

**UNIT V HVAC COMPONENTS & REEFER CONTAINERS****9**

Refrigeration compressors – types, L.P cut out, H.P cut out, lubricating oil low pressure cut out. Refrigeration Condensers – types and construction. Expansion valves – types and construction. Types of refrigerated cargoes, importance of maintaining temperature, humidity, oxygen content and air flow in reefer container.

**TOTAL: 45 PERIODS****OUTCOMES:**

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

CO No	CO Statements	RBT Level
1	Relate the difference between power plants used in marine industry and their environmental impacts.	2
2	Apply the knowledge of Marine auxiliary machinery to work on-board the ships.	3
3	Relate the difference between shore based and marine refrigeration systems.	2
4	Apply the knowledge of Marine air conditioning systems to work on-board the ships	3
5	Apply the Principle of HVAC Components to run marine refrigeration units safely and efficiently.	3

## TEXT BOOKS:

1. D.A.Taylor, "Introduction to Marine Engineering", Second Edition, Butterworth Heinemann, Woburn, USA, 2011.
2. Arora C.P., "Refrigeration & Air Conditioning", 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2014.
3. J.R.Stott, "Refrigerating Machinery and Air Conditioning Plant", Marine Engineering Practice, Vol-1 P Part-04, IMarEST, London, 1998.

## REFERENCES:

1. McGeorge.H.D, "Marine Auxiliary Machinery", 7<sup>th</sup> Edition, Butterworth Heinemann, Woburn, USA, 2015
2. Manohar Prasad, "Refrigeration and Air Conditioning", 3<sup>rd</sup> Edition, New Age International (P) Ltd., Publishers, Chennai, 2015
3. C. Maheshwar, "Container Refrigeration", First Edition, Witherby Seamanship International, Livingston, UK, 2008.

## COURSE ARTICULATION MATRIX

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

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

CY22161

**CHEMISTRY LABORATORY**  
(Common to all branches except AD, CS, IT)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**COURSE OBJECTIVES:**

The objective of the Chemistry Laboratory is to acquaint the students with the basic phenomenons/concepts of chemistry, the students face during the course of their studies in the industry and engineering field.

1. To appreciate the need and importance of water quality parameters for industrial and domestic use.
2. To gain the knowledge on electrochemical instrumentation techniques like potential and current measuring used in electrochemistry applications
3. To impart knowledge on separation of components using paper chromatography.
4. To enhance the thinking capability about polymers and properties like molecular weight.

**LIST OF EXPERIMENTS (Minimum 8 Experiments)**

1. Determination of DO content of water sample by Winkler's method.
2. Determination of strength of given hydro chloric acid using pH meter
3. Determination of the strength of acids in a mixture using conductivity meter
4. Estimation of iron content of the water sample using spectrophotometer (phenanthroline /thiocyanate method)
5. Determination of total, temporary & permanent hardness of water by EDTA Method.
6. Estimation of iron content of the given solution using potentiometer.
7. Determination of alkalinity in water sample.
8. Determination of Single electrode potential.
9. Separation of components from a mixture of red and blue inks using Paper chromatography.
10. Determination of molecular weight of polymer by using Ostwald's/Ubbelohde viscometer.

**TOTAL: 15 Periods**

**OUTCOMES:**

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

<b>CO No</b>	<b>CO Statements</b>	<b>RBT Level</b>
1	Distinguish hard and soft water, solve the related numerical problems on water, purification and its significance in industry and daily life.	3
2	Interpret the knowledge of instruments to measure potential and current related parameters.	2
3	Demonstrate the basic principle for separation of components using paper chromatography.	3
4	Evaluate the molecular weight of a polymer using Ostwald's/Ubbelohde Viscometer.	3

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Common apparatus: Pipette, Burette, conical flask, porcelain tile, dropper (each 30 nos)

1.	Iodine flask	30 Nos
2.	pH meter	5 Nos
3.	Conductivity meter	5 Nos
4.	Spectrophotometer	5 Nos
5.	Oswald/Ubbelohde Viscometer	30 Nos

**TEXT BOOKS:**

1. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., “Vogel’s Textbook of practical organic chemistry”, LBS Singapore 1994.
2. Jeffery G.H., Bassett J., Mendham J. and Denny vogel’s R.C, “Text book of quantitative analysis chemical analysis”, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.

**REFERENCES:**

1. Daniel R. Palleros, “Experimental organic chemistry” John Wiley & Sons, Inc., New York 2001.
2. Kolthoff I.M., Sandell E.B. et al. “Quantitative chemical analysis”, Mcmillan, Madras 1980

At the end of the course, add the Course articulation matrix as per the following format:

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	2				3	3	3	1		1	2			
2.	3	2	1			3	3	3							
3.	3					3	3					2			
4.	3			1		3	3	3							

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
0	0	4	2

**COURSE OBJECTIVES:**

1. To impart knowledge in handling various workshop tools
2. To Impart knowledge in the fabrication of sheet metal components
3. To Impart knowledge in making different joints – V, square and round
4. To Impart knowledge in joining metals through arc welding – butt, lap and corner joint

**LIST OF EXPERIMENTS****SHEET METAL**

Fabrication of tray, cone and cylinder with sheet metal

15

**FITTING**

Practice in chipping, filing, drilling – Making V, square and half-round joints

15

**WELDING**

Arc Welding of the butt joint, Lap joint, and Corner joint. Demonstration of gas welding.

15

**TOTAL: 45 PERIODS****OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Handle different workshop tools	3
2	Have the Knowledge of sheet metal fabrication	3
3	Fabricate different joints like V, Square and Round	3
4	Have knowledge of joining metals using the Arc welding process	2

**COURSE ARTICULATION MATRIX**

COs	POs												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1.	3											3	3	3	
2.	3											3	3	3	
3.	3					2						3	3	3	
4.	3					2						3	3	3	

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)





# ***Semester II***

HS22251

அறிவியல் மற்றும் தொழில் நுட்பத்தில் தமிழ்  
Science and Technology in Ancient Tamil Society  
(Common to all branches)

L	T	P	C
2	0	0	2

பாடத்தின் நோக்கங்கள் :

1. அறிவியலில் தமிழின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.
2. தொழில்நுட்பத்தில் தமிழ் பாரம்பரியத்தின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்.

**Course Objectives :**

1. They will know about the use of Tamil in science.
2. Learn about the impact of Tamil heritage on technology.

**அலகு 1**

**அறிவியல் தமிழ்**

3

கருவி உருவாக்கம் - ஆராய்ச்சி மேம்பாடு - கல்வி வளர்ச்சி - அறிவியல் தமிழ் சொற்கள் உருவாக்கம்.

**UNIT -1 SCIENTIFIC TAMIL**

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation.

**அலகு 2**

**தொழில் நுட்பத்தில் தமிழ்**

12

வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் : சங்க காலத்தில் கட்டுமானப் பொருட்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டு தலங்கள் - பல்லவர்களின் சிற்பங்கள் மற்றும் கோவில்கள் (மாமல்லபுரம்) - நாயக்கன் கால கோவில்கள் (மதுரை மீனாட்சி அம்மன் கோவில்), திருமலை நாயக்கர் மஹால், செட்டி நாட்டு வீடுகள்.

உற்பத்தி தொழில்நுட்பம் : கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள், தங்கம், தாமிரம், இரும்பு பற்றிய அறிவு - தொல்பொருள் சான்றுகள் - சுட்டக் களிமண் மணிகள், சங்கு மணிகள், எலும்பு மணிகள்.

விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் : அணைகள், ஏரிகள், குளங்கள், மதகுகள், சோழர் கால குழுவி தூம்பு ஆகியவற்றின் முக்கியத்துவம் - கால்நடை பராமரிப்பு, கால்நடைகளின் பயன்பாட்டிற்காக வடிவமைக்கப்பட்ட கிணறுகள். விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் பற்றிய அறிவு - மீன்பிடித்தல், முத்து குளித்தல், சங்கு சேகரித்தல்.

தமிழ் கணினி: அறிவியல் தமிழ் வளர்ச்சி - தமிழ் கணினி, தமிழ் புத்தகங்களின் டிஜிட்டல் மயமாக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் மெய்நிகர் அகாடமி - சொற்குவை திட்டம்.

தமிழின் எதிர்காலமும் தகவல் தொழில்நுட்பமும்- உலகமயமாக்கலும் தகவல் தொழில் நுட்பமும் - கணினிக்கு தமிழ் கற்று கொடுத்தல் - தமிழ் மொழித் தொழில் நுட்பத்தில் வளங்கள்.

**UNIT -2 TAMIL IN TECHNOLOGY**

Design and Construction Technology : Building materials in Sangam age – Great temples of Cholas and other workshop places – Sculptures and Temples of Pallavas (Mamallapuram) – Temples of Nayakas period (Madurai Meenakshi amman temple), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

Manufacturing Technology : Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

Agriculture and Irrigation Technology: Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

Tamil Computing : Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project. Future of Tamil and Information Technology- Globalization and Information Technology-Teaching Tamil for Computer-Resources in Tamil Language Technology.

பாடநெறி முடிவுகள் :படிப்பை வெற்றிகரமாக முடித்தவுடன், மாணவர்கள் பின்வருவனவற்றைச் செய்ய முடியும்.

**COURSE OUTCOMES :** On completion of the course, the student will be able to

பா.வெ. எண் CO No	பாடத்திட்டத்தின் வெளிப்பாடு Course Outcomes	RBT level
1	அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள் They will know about the use of Tamil language in science	2
2	பல்வேறு தொழில்நுட்பத்தில் தமிழ் மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள் They will learn about the influence of Tamil language in various technologies	3

பாட நூல்கள்:

டாக்டர், வா.செ. குழந்தைசாமி (1985), " அறிவியல் தமிழ் " , பாரதி பதிப்பகம், 126/108, உஸ்மான் சாலை, தியாகராய நகர் , சென்னை 600017

சுப. திண்ணப்பன், (1995), "கணினியும் தமிழ் கற்பித்தலும்", புலமை வெளியீடு, 38-B மண்ணத்தோட்டத் தெரு, ஆழ்வார்பேட்டை, சென்னை 600018

மு. பொன்னவைக்கோ, (2003), " வளர் தமிழில் அறிவியல் – இணையத்தமிழ்", அனைத்திந்திய அறிவியல் தமிழ்க்கழகம், தஞ்சாவூர் 615 005.

துரை. மணிகண்டன், (2008), "இணையமும் தமிழும்", நல் நிலம் பதிப்பகம், 7-3, சிமேட்லி சாலை, தியாகராய நகர், சென்னை 600 017.

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. Enable learners to define and understand technical communication and scientific writing
2. Expose learners to the technicalities of seminar presentation, group discussion, and public speaking
3. Develop learners' writing skills for scientific and documenting purposes
4. Improve learners' ability to draft correspondences for business purposes
5. Cultivate learners' ability to holistically understand the nuances of job interviews and recruiting process.

**UNIT I****9 Hours**

Listening - AV files pertaining to manufacturing processes of products, scientific documentaries; Speaking - syllable division and word stress, intonation, sharing opinions; Reading - news articles related to science and technology; Writing - definitions, instruction, recommendation, data interpretation, resume; Grammar -tenses and their aspects, sentence connectors – discourse markers, sequential words, active and passive voice, subject-verb agreement.

**UNIT II****9 Hours**

Listening - AV pertaining to marketing strategies, peer reading and pronunciation; Speaking- turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; Reading - analytical documents, descriptive documents; Writing - fliers, brochures, resume - letter of application, checklists; Grammar - modal verbs, clauses - types and uses, conditional clauses, articles.

**UNIT III****9 Hours**

Listening - AV related to how to use components, scientific description, Speaking - speaking for motivation and initiation, speaking at a seminar presentation; Reading - scientific journals, papers; Writing - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; Grammar - phrasal verbs, prepositions, technical and scientific affixes.

**UNIT IV****9 Hours**

Listening - scientific debates, crisis management; Speaking - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, Reading- documented evidence of uses and functions of a product, review of a product, Writing - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. Grammar - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

**UNIT V****9 Hours**

Listening - AV of Group discussions, panel discussions, face-to-face interviews for recruitment purposes; Speaking- speaking at group discussions, interviewing a personality, answering at the interviews; Reading - WebPages of top notch engineering companies, Writing - blogging, e-mails, letter of complaint, minutes of the meeting; Grammar - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improving ideas).

**TOTAL: 45 PERIODS**

**REFERENCES:**

1. Department of English, Anna University. *Mindsapes: English for Technologists and Engineers*. Orient Blackswan, Chennai. 2012.
2. Downes, Colm, *Cambridge English for Job-hunting*, Cambridge University Press, New Delhi. 2008
3. Murphy, Raymond, *Intermediate English Grammar with Answers*, Cambridge University Press 2000.
4. Thomson, A.J., *Practical English Grammar 1 & 2*, Oxford, 1986.
5. Herbert A J, *The Structure of Technical English*, Longman, 1965.

**Websites**

1. <http://www.usingenglish.com>
2. <http://www.uefap.com3>
3. <https://owl.english.purdue.edu/owl/>
4. [www.learnenglishfeelgood.com/esl-printables-worksheets.html](http://www.learnenglishfeelgood.com/esl-printables-worksheets.html)

**Software**

1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University Press 2017.
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition.
5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

**OUTCOMES:**

Upon successful completion of the course, the students should be able to

CO No	CO Statements	RBT LEVEL
1	Understand the nuances of technical communication and scientific writing	3
2	Present papers and give seminars	6
3	Discuss in groups and brainstorm	6
4	Draft business correspondences and write for documenting purposes	6
5	Face job interviews with confidence	6

**COURSE ARTICULATION MATRIX**

COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.										3					
2.										3					
3.										3					
4.										3					
5.										3					

3 denotes ‘a strong correlation’ as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in technical and professional situations.

L	T	P	C
3	1	0	4

**COURSE OBJECTIVES:**

The student should be made to:

1. Understand the concepts of ordinary differential equations in the field of engineering.
2. Understand the methods to solve higher order differential equations and apply real time engineering problems.
3. Acquire the concepts of vector calculus for solving problems.
4. Understand the concepts of analytic functions which are widely used in marine engineering problems.
5. Acquire knowledge in Laplace transforms which are used in efficiently solving the problems that occur in various branches of engineering disciplines.

**UNIT I ORDINARY DIFFERENTIAL EQUATIONS – FIRST ORDER AND APPLICATIONS**

12

Definition, order and degree, formation of differential equation. Solution of first order, first degree equations in variable separable form, homogeneous equations, other substitutions, equations reducible to homogeneous and exact differential equations. Equations reducible to the exact Integration Factor, Linear differential equation of first order first degree, reducible to linear, applications to electrical circuits and orthogonal trajectories.

**UNIT II ORDINARY DIFFERENTIAL EQUATIONS – HIGHER ORDER AND APPLICATIONS**

12

Higher (nth) order linear differential equations - definition and complementary solution, Methods of obtaining PI, Method of variation of parameters, Method of undetermined coefficients, Cauchy's Homogeneous LDE and Legendre's equations, System of Ordinary Differential Equations Simultaneous equations in symmetrical form, Applications to deflection of beams, struts and columns. Applications to electrical circuits and coupled circuits.

**UNIT III VECTOR CALCULUS**

12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT IV ANALYTIC FUNCTIONS**

12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping :  $w = z+c$ ,  $cz$ ,  $1/z$ , and bilinear transformation.

**UNIT V LAPLACE TRANSFORM**

12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transforms as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Apply the basic concepts of ordinary differential equations and its applications in marine engineering problems.	3
2	Apply various techniques in solving differential equations.	3
3	Solve gradient, divergence and curl of a vector point function and related identities, evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	3
4	Recognize fundamental properties of analytic functions and construct simple conformal maps.	3
5	Apply Laplace transforms to solve differential equations.	3

#### TEXT BOOKS:

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10<sup>th</sup> Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics", 43<sup>rd</sup> Edition, Khanna Publications, Delhi, (2015).

#### REFERENCES:

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9<sup>th</sup> edition, Laxmi Publications(p) Ltd., 2014.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Reed's Marine Engineering Series, Thomas Reed Publications, 1997.

#### WEB LINK:

1. <https://nptel.ac.in/courses/111/105/111105134/>
2. <https://nptel.ac.in/courses/111/105/111105121/>

#### COURSE ARTICULATION MATRIX

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3	2									3			
2.	3	3	2									3			
3.	3	3										3			
4.	3	3										3			
5.	3	3	2									3			

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. To introduce the fundamentals of metallurgy, Fe-C system, properties of metals and crystallography.
2. To introduce the importance of heat treatment and phase transformations with studies on surface treatment.
3. To acquaint the students with the importance of mechanically characterizing of the materials with known methods.
4. To impart knowledge on material selection for marine applications, welding and corrosion metallurgy, bonding and NDT.
5. To introduce the students to the properties of various new materials and their marine applications.

**UNIT I FUNDAMENTALS OF METALLURGY****10**

Basic metallurgy, metals, and properties of materials used on board ships. Crystallography – Crystal structures: BCC, FCC and HCP – directions and planes – linear and planar densities – crystal imperfections – edge and screw dislocations – grain and twin boundaries - Metallurgy of steel and cast iron - Iron - Iron carbide equilibrium diagram. Classification of steel and cast Iron, microstructure - Aluminium, copper and its alloys - Effect of alloying additions on steel.

**UNIT II HEAT TREATMENT****10**

Definition – Full annealing, stress relief, re-crystallisation and spheroidizing – normalising, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram - Hardenability, Jominy end quench test – Austempering, martempering – case hardening - carburising, nitriding, cyaniding, carbonitriding, flame and induction hardening – precipitation hardening. Vacuum and Plasma hardening – Current trends, Thermo-mechanical treatments.

**UNIT III MECHANICAL PROPERTIES AND TESTING****9**

Mechanism of plastic deformation, slip and twinning – Types of fracture – Failure modes - Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - Izod and Charpy, Fatigue - fatigue tests - methods of increasing fatigue life and creep tests - creep resistance - creep curves - mechanisms of creep - creep-resistant materials, fracture toughness tests.

**UNIT IV MATERIAL SELECTION, WELDING METALLURGY, CORROSION METALLURGY, BONDING AND NDT****8**

Selection of materials in construction of marine equipment, bonding plastics, adhesives and bonding, Welding Metallurgy - HAZ around a weld –significance, metallurgical effects on corrosion, materials selection - alteration of environments – marine coatings. Destructive and non-destructive testing of materials – different methods of testing and mechanical characterization.

**UNIT V NEW MATERIALS****8**

Non-metallic materials – Polymers – types of polymer, Engineering Ceramics – Properties and applications of Al<sub>2</sub>O<sub>3</sub>, SiC Composites-Classifications-Role of Matrix and reinforcement processing of fiber reinforced plastics- Applications of Composites- applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types - Applications of marine materials

**TOTAL: 45 PERIODS**



**OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Understand the Fundamentals of Metallurgy, Properties of metals and crystallography.	2
2	Understand the various heat treatment processes.	2
3	Understand the various mechanical property testing methods.	2
4	Understand how different materials are selected for different uses on board ships, welding and corrosion metallurgy, bonding, and Non-destructive testing.	2
5	Appreciate the various properties of the latest materials, including non-metals.	2

**TEXT BOOKS:**

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", 9th Indian Edition, Prentice-Hall of India, 2013.
2. Parasihivamurthy, K.I., "Material Science and Metallurgy", 1st Ed. Pearson, 2012.
3. Jindal, U.C., Atish Mozumder, "Material Science and Metallurgy", 1st Ed. Pearson, Third Impression 2013.
3. Todd, "Selecting Material for Sea Water Systems", Marine Engineering Practice, Vol-1, Part-10, IMarEST, London.
4. Raghavan. V, "Materials Science and Engineering", 6th edition, Prentice Hall of India Pvt. Ltd, 2015.

**REFERENCES:**

1. Eyres, D.J. "Ship Construction" 7th Edition, 2015.
2. William D Callister "Material Science and Engineering", John Wiley and Sons, 7<sup>th</sup> Edition, 2007.
3. E. McCafferty "Introduction to Corrosion Science", Springer, 2010<sup>th</sup> Edition.
4. Askeland, D. "Materials Science and Engineering", Brooks/Cole, 1<sup>st</sup> Edition, 2010.
5. Smith, W.F., Hashemi, J. & Prakash, R. "Materials Science and Engineering", 5<sup>th</sup> Edition, Tata McGraw Hill, 2013.
6. Dieter, G.E., "Mechanical Metallurgy", McGraw-Hill, SI Edition, 1988.
7. Sindo Kou., "Welding Metallurgy", Wiley, 2<sup>nd</sup> Edition, John Wiley and Sons, 2003.

**COURSE ARTICULATION MATRIX**

COs	POs												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1.	3	2											3	3	
2.	3	2											3	3	
3.	3	2					2						3	3	
4.	3	2				2	2						3	3	
5.	3	2				2	2						3	3	

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. To understand the concept of equilibrium of particles.
2. To understand the concept of equilibrium of rigid bodies.
3. To understand the concept of first and second moment of the area.
4. To understand the concept of various types of frictions and applications.
5. To understand the principle of work energy method, Newton's law and the impact of elastic bodies.

**UNIT I BASICS AND STATICS OF PARTICLES 9**

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

**UNIT II STATICS OF RIGID BODIES AND ANALYSIS OF STRUCTURES 9**

**STATICS OF RIGID BODIES:** External, Internal forces - moment of a force - varignon's theorem - moment of a couple - resolution of a force into a force and a couple - reduction of a system of forces - reactions at supports and connections - equilibrium of a two and three force bodies - case studies.  
**ANALYSIS OF STRUCTURES:** Simple trusses - method of joints, method of sections - joints under special loading conditions - space trusses - analysis of frames.

**UNIT III CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA 9**

Centroid of areas, composite areas, Centre of Gravity- Theorems of Pappus and Guldinus- Parallel axis theorem and perpendicular axis theorem - determination of moment of inertia of plane figures, polar moment of inertia-radius of gyration - mass moment of inertia of simple solids.

**UNIT IV FRICTION 9**

Laws of dry friction - angles of friction-coefficient of static and kinetic friction - wedges - surface contact friction - belt friction - journal bearings - axle friction - thrust bearings - disc friction - Point contact friction - wheel friction - rolling resistance - case studies.

**UNIT DYNAMICS OF PARTICLES 9**

**KINEMATICS:** Introduction-plane, rectilinear and rotary motion-time dependent motion -rectangular coordinates - projectile motion.

**KINETICS:** Newton's II law - D'Alembert's principle - Energy - potential energy - kinetic energy - conservation of energy - work done by a force - work energy method.

**IMPULSE AND MOMENTUM:** Concept of conservation of momentum - Impulse-Momentum principle - Impact - Direct central impact, oblique central impact, impact of a moving train on the spring board.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	Understand and analyze the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.	2
2	Understand and analyze the concept of reaction forces and moment of various support systems with rigid bodies in 2D and 3D in equilibrium.	2
3	Evaluate centroid, Area moment of Inertia and Mass moment of Inertia of cross section of any structural member.	3
4	Correlate the engineering problems dealing with force, displacement, velocity and acceleration equations	3
5	Evaluate the problems in friction and rigid body dynamics	3

**TEXT BOOKS:**

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 11<sup>th</sup> Edition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.
3. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics Statics and Dynamics", 3<sup>rd</sup> Edition, Vikas Publishing House Pvt. Ltd., 2005.

**REFERENCES:**

1. Borelli P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeler, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.
3. Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4th Edition, Pearson Education Asia Pvt. Ltd., 2005.
4. Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013.
5. Timoshenko S, Young D H, Rao J V and Sukumar Pati, Engineering Mechanics, 5th Edition, McGraw Hill Higher Education, 2013.
6. NPTEL Course on Engineering Mechanics, IIT Guwahati Prof. U.S. Dixit, Dr. G. Saravana Kumar (<https://nptel.ac.in/courses/112103108>)

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	2	2	1	2								2		
2.	3	2	2	1	2								2		
3.	3	2	3	1	3								2		
4.	3	2	3	1	3								2		
5.	3	2	3	1	3								2		

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
2	0	2	3

**COURSE OBJECTIVES:**

1. Provide a sound foundation about the basic computer terminologies, hardware and software devices.
2. Introduce fundamental concepts and cutting-edge technologies in Information Technology
3. Use Python data structures -- lists, tuples, dictionaries in solving a problem
4. To define Python functions and call them.
5. To develop Python programs with conditionals and loops.

**UNIT I COMPUTER BASICS****6+3**

Characteristics of a computer - Classification of Computers – Computer Organization and Architecture – Central Processing Unit – Communication among various units – Data Representation – Number System - Computer Memory and Storage: Memory Hierarchy – Primary and Secondary Storage – Importance of Input and Output Hardware – Computer Terminals.

Suggested Activities: Practical – Word Processing and Spreadsheet

**UNIT II NETWORKS AND INTERNET****6+3**

Data Communication – Transmission Media - The Benefits of Networks - Types of Networks – Network Topologies - Client/Server & Peer-to-Peer – VPNs - Wired and Wireless Networks - Basic Internet Terms – Internet Applications - Narrowband, Broadband, & Access Providers - Internet Tools: Web browsers – E-mail - Search Engines.

Suggested Activities: Practical

Demonstration of basic networking commands.

**UNIT III COMPUTER SECURITY AND EMINENT TECHNOLOGIES****6+3**

Computer Security: Introduction to Computer Security – Security Threats – Cryptography and types – Firewall and Types of Firewall. Eminent Technologies: Mobile communications, Blue tooth, Global Positioning system, Electronic Data Interchange.

Suggested Activities : Practical : Demonstration of System Management and user management.

**UNIT IV DATA, EXPRESSIONS, STATEMENTS****6+3**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, precedence of operators, comments; function definition and use, flow of execution, parameters and arguments – Local and Global Scope; Conditional Statements – Iterative Statements

Suggested Activities

Practical : Demonstration of programs using basic features of python.

**UNIT V STRING, LISTS, TUPLES, DICTIONARIES****6+3**

Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Lists: list operations, list slices, list methods, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods;

Suggested Activities : Practical - Demonstration of programs using Strings, Lists, Tuples and dictionary

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course, the student should be able to:

CO No	CO Statements	RBT Level
1	Understand the characteristics and data processing methodologies of a computer.	2
2	Differentiate various networks and their underlying terminologies.	3
3	Understand the recent advancements in computers.	2
4	Develop algorithmic solutions to simple computational problems by decomposing into multiple functions	5
5	Represent compound data using Python lists, tuples, dictionaries for solving problems	4

**TEXT BOOKS:**

1.Introduction to Information Technology, IITL Education Solution Ltd. 2nd edition 2012 Pearson Education.

2.Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/OReilly Publishers, 2016 \_(http://greenteapress.com/wp/ think-python/)

**REFERENCES:**

1.Brian K Williams, Stacey C Sawyer “Using Information Technology – A practical introduction to computers and communications”, 11th edition 2015 ,Mc Graw Hill (P) Ltd.,

2.Turban, Rainer, Potter, “Introduction to Information Technology”, second edition, Wiley Publications.

3.Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

4.Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.

5.Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.

**Evaluation Method**

60% Theory and 40% Practical

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	1	3							3			2			
2.	1	3							3			2			
3.	1	3							3			2			
4.	1		3	2	1				3			2			
5.	1		3	2	1				3			2			

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

The students should be able,

1. To apply the first law of thermodynamics to engineering applications.
2. To analyze heat engine, heat pump and refrigerator using the second law of thermodynamics.
3. To understand steam formation, properties of steam and apply it to the Rankine cycle.
4. To understand air standard cycles and analyze them.
5. To understand the basics of refrigeration.
- 6.

**UNIT I FIRST LAW OF THERMODYNAMICS AND ITS APPLICATIONS 9**

Thermodynamic concepts – concepts of continuum, thermodynamic properties, equilibrium processes, thermodynamic cycle, work, heat, temperature and Zeroth law of thermodynamics. First law of thermodynamics – applications to closed and open systems, internal energy, specific heats, enthalpy – application to steady flow devices in Marine Engineering. Simple problems

**UNIT II SECOND LAW OF THERMODYNAMICS AND ITS APPLICATIONS 9**

Thermodynamic systems – Second law of thermodynamics, Statements, T-s diagrams, Reversibility, causes of irreversibility, Carnot theorem, Carnot cycle, Reversed Carnot cycle, difference between heat engine, refrigerator and heat pump, applications to marine engineering. Clausius inequality, entropy, available energy. Simple problems

**UNIT III STEAM FORMATION AND RANKINE CYCLE 9**

Thermodynamic properties of pure substances, property diagram, PVT surface of water, calculation of properties. Introduction – Rankine cycle, Analysis of Rankine cycle, Rankine efficiency, Methods of improving Rankine efficiency, Reheat cycle, Regenerative cycle, application to marine steam turbine plant, Simple problems.

**UNIT IV AIR STANDARD CYCLES 9**

Properties of ideal gases, gas laws. Air standard cycles for Marine Engines – Elementary principles and cycles of operation – Otto cycle, Diesel cycle, Dual cycle – Work done, power developed – Indicated and brake thermal efficiency, mechanical efficiency, overall efficiency - Gas turbine cycle – Brayton / Joule cycle, Simple problems.

**UNIT V REFRIGERATION 9**

Vapour compression cycle -components and principle of operation, refrigerating effect, Co-efficient of Performance, Methods of improving C.O.P. Vapour absorption Refrigeration – Components and principle of operation, Marine Refrigerants and their desirable properties, ODP, GWP, use of Refrigerant tables and charts – Simple Problems.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students should be able to:

CO No	CO Statements	RBT Level
1	To understand the first law of thermodynamics along with engineering applications.	2
2	To recognize heat engines, heat pumps and refrigerators and applications of the second law of thermodynamics.	3
3	To comprehend the steam formation process, properties of steam and it's application to Rankine cycle.	3
4	To analyse various air standard cycles and their application.	3
5	To know the vapour compression refrigeration cycle and its analysis.	2

**TEXT BOOKS:**

1. Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 8th Edition, Tata McGraw Hill, 2016.
2. Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition, Anuragam Publications, 2014.
3. Rathakrishnan. E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice-Hall of India Pvt. Ltd, 2015.

**REFERENCES:**

1. William Embleton OBE., "REEDS Applied Heat for Engineers", Thomas Reed Publication, 4th Edition, Reprint 2011.
2. K.K. Ramalingam, "Engineering Thermodynamics", 1st Edition, Scitech Publications (India) Pvt. Ltd., 2009
3. R.K. Rajput, "Thermal Engineering", 9th Edition, Laxmi Publications, 2014

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3				3	3							3	
2.	3	3				3	3							3	
3.	3	3				3	3							3	
4.	3	3				3	3							3	
5.	3	3				3	3							3	

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

**COURSE OBJECTIVES:**

1. To understand the basic theorems used in electrical circuits.
2. To educate on the different concepts and functions of electrical machines.
3. To introduce electron devices and their applications.
4. To explain the principles of digital electronics.
5. To impart knowledge on the principles of measuring instruments.

<b>UNIT I</b>	<b>ELECTRICAL CIRCUITS</b>	<b>9</b>
Ohm's Law – Kirchhoff's Laws - Steady State Solution of DC Circuits using Mesh and Nodal Analysis - Introduction to AC Circuits - Waveforms and RMS Value - Power and Power factor - Single Phase and Three Phase AC Balanced Circuits.		
<b>UNIT II</b>	<b>ELECTRICAL MACHINES</b>	<b>9</b>
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.		
<b>UNIT III</b>	<b>SEMICONDUCTOR DEVICES AND APPLICATIONS</b>	<b>9</b>
Characteristics of PN Junction Diode - Zener Effect - Zener Diode - LED, Photo diode and its Characteristics-Half Wave and Full Wave Rectifiers-Voltage Regulation. Bipolar Junction Transistor-Common Emitter Configuration, Characteristics and CE as an Amplifier - Photo transistors.		
<b>UNIT IV</b>	<b>DIGITAL ELECTRONICS</b>	<b>9</b>
Number System Conversion Methods–Simplification of Boolean Expression using K-Map – Half and Full Adders – Flip-Flops – Shift Registers - SISO, SIPO, PISO, PIPO and 4-bit Synchronous and Asynchronous UP Counters.		
<b>UNIT V</b>	<b>MEASURING INSTRUMENTS</b>	<b>9</b>
Types of Signals: Analog and Digital Signals- Construction and working Principle of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters. Instrumentation Amplifier, – R-2R ladder Type D/A Converter - Flash Type and Successive Approximation Type A/D Converter.		

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. Sedha. R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.



**REFERENCES:**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. Mehta VK, "Principles of Electronics", S. Chand & Company Ltd, 2010.
3. M. Morris Mano, "Digital Logic & Computer Engineering", Prentice Hall of India, 2004.
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition, 2007.

**BL – Bloom’s Taxonomy Levels**

CO No	CO Statements	RBT LEVEL
1	Compute the electric circuit parameters for simple problems	4
2	Understand the construction and characteristics of different electrical machines.	4
3	Describe the fundamental behavior of different semiconductor devices and circuits.	4
4	Design basic digital circuits using Logic Gates and Flip-Flops.	4
5	Analyze the operating principles and working of measuring instruments.	4

**COURSE ARTICULATION MATRIX**

COs	POs												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3	3	3			2					2			
2.	3	3	3	3			2					2			
3.	3	3	3	3			2					2			
4.	3	3	3	3			2					2			
5.	3	3	3	3			2					2			

**COURSE OBJECTIVES:**

1. To develop skills to use software to create 2D and 3D models.

L	T	P	C
0	0	2	1

**LIST OF EXERCISES USING SOFTWARE CAPABLE OF DRAFTING AND MODELING:**

1. Study of capabilities of software for Drafting and Modeling - Coordinate systems (absolute, relative, polar, etc.) - Creation of simple figures like polygons and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbols.
3. Drawing of curves like parabola, spiral, involute using B spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

**TOTAL: 45 PERIODS****OUTCOMES:**

CO No	CO Statements	RBT Level
1	Students will be able to draw the two-dimensional sketches by using different commands in Auto CAD software.	3
2	Students will be able to draw the Isometric projection drawings from the two dimensional drawing and building layouts.	3
3	Students will be able to draw the basic solid models drawing and make a pattern material model for different appearance of the solids.	3

**REFERENCES:**

1. George Omura and Brian C. Benton, "Mastering AutoCAD 2016 and AutoCAD LT 2016: Autodesk Official press", Wiley Publishers, 2015.
2. Elise Moss, "Autodesk AutoCAD 2016 Fundamentals", SDC Publications, 2015.
3. James D. Bethune, "Engineering Graphics with AutoCAD 2017", PEACHPIT Press, 2016.
4. Cheryl R. Shrock, Steve Heather, "Advanced AutoCAD 2016 Exercise Workbook", Industrial Press, 2016.
5. Ibrahim Zeid and Sivasubramanian R, "CAD/CAM: Theory and Practice", Tata McGraw-Hill Education India, 2009.

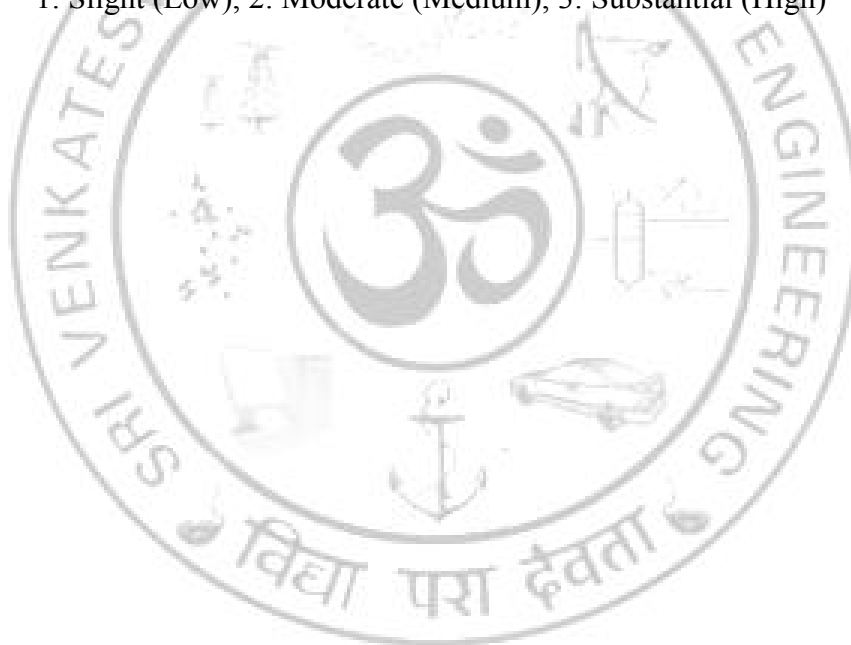
**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Sl. No	Description of Equipment	Quantity
1.	Pentium IV computer or better hardware, with suitable graphics facility	30 Nos.
2.	Licensed software for Drafting and Modeling.	30 Licenses
3.	Laser Printer or Plotter to print / plot drawings	2 Nos.

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3		3									3		
2.	3		3									3		
3.	3		3									3		

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)



**EE22111 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING  
LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**COURSE OBJECTIVES:**

- To provide exposure to the students with hands-on experience in the basics of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and the basic laws of Electrical Circuits.

**LIST OF EXPERIMENTS**

1. Wiring – Residential house wiring and Stair case wiring.
2. (a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC.  
(b) Study of three phase system.
3. Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4. (a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice.  
(b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5. (a) VI Characteristics of Solar photovoltaic panel.  
(b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6. Design a 5V/12V Regulated Power Supply using FWR and IC7805 / IC7812.
7. DC Analysis- Verification of Ohm’s Law and Kirchhoff’s Laws.
8. Study of transformer and motor characteristics.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students should be able to:

<b>CO No</b>	<b>CO Statements</b>	<b>RBT Level</b>
1	Wiring of basic electrical system and measurement of electrical parameters.	4
2	Verifying the basic laws of electric circuits and understanding the working of Electrical Machines	4
3	Study of basic electronic components, circuits and solar photovoltaic panels and their implementation.	4
4	Understand the concept of a three-phase system.	4
5	Construct a fixed voltage regulated power supply and measure the signals in each stage.	4

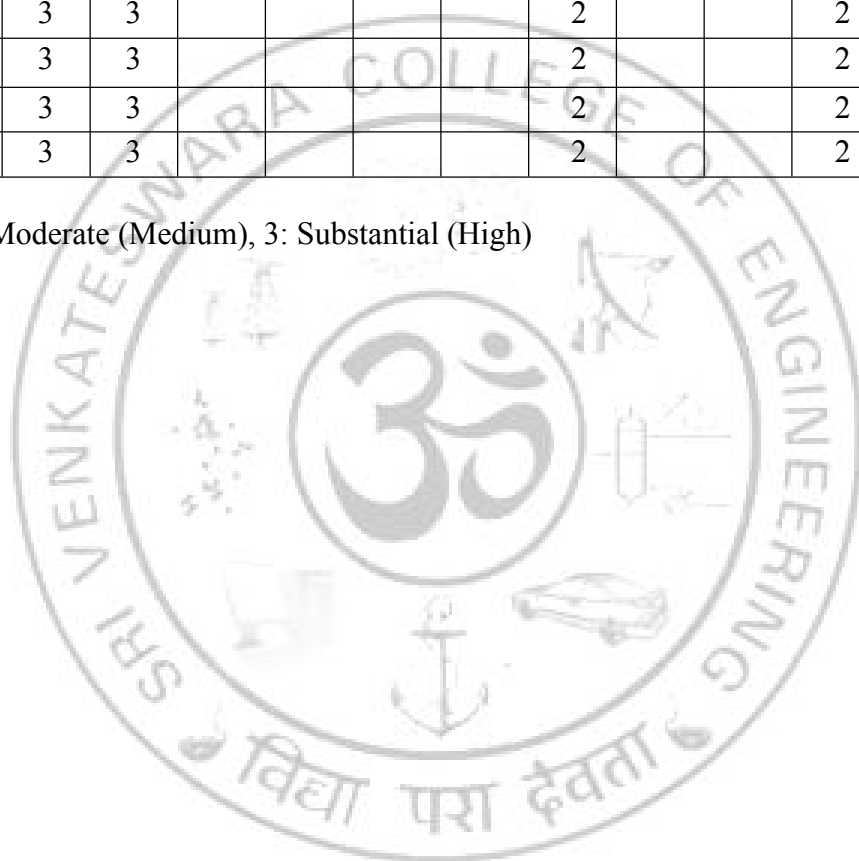
## REFERENCES:

1. Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata Mc Graw Hill (India), Second Edition, 2013.
2. Sedha R.S., "A Text Book of Applied Electronics", S.Chand&Co., 2014.

## COURSE ARTICULATION MATRIX

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3	3	3					2			2			
2.	3	3	3	3					2			2			
3.	3	3	3	3					2			2			
4.	3	3	3	3					2			2			
5.	3	3	3	3					2			2			

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)



L	T	P	C
0	0	2	1

**COURSE OBJECTIVES:**

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

**LIST OF EXPERIMENTS: ( Any EIGHT Experiments)**

1. a) Determination of Wavelength, and particle size using Laser.  
b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3. Determination of the wavelength of mercury spectrum – spectrometer grating.
4. Determination of thermal conductivity of a bad conductor – Lee’s Disc method.
5. Determination of Young’s modulus by non-uniform bending method.
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.
7. Determination of Rigidity modulus of a given wire -Torsional Pendulum
8. Energy band gap of a Semiconductor
9. Determine the Hysteresis loss of a given Specimen
10. Calibration of Voltmeter & Ammeter using potentiometer.

**OUTCOMES:**

The hands-on exercises undergone by the students will help them to apply physics principles of, optics and thermal physics to evaluate engineering properties of materials.

**REFERENCES:**

1. "Physics Laboratory practical manual", 1<sup>st</sup> Revised Edition by Faculty members, 2018.

**Course outcomes**

CO No	CO Statements	RBT Level
1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	4
2	Comprehend the experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of engineering.	3
3	Apply the basic concepts of Physical Science to think innovative and also improve the creative skills that are essential for engineering.	3
4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	3
5	Extend the scope of an investigation into whether or not the results come out as expected	3

### COURSE ARTICULATION MATRIX

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	3	3	2	3	2				3	1		2			
2.	3	3		3		2			3	1		2			
3.	3	3	2	3	2	2			3	1		2			
4.	3	3		3					3	1		2			
5.	3	3		3	2				3	1		2			

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

