



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

# **B.E. Automobile Engineering**

## *CURRICULUM AND SYLLABUS*

### *REGULATIONS 2022*

### *CHOICE BASED CREDIT SYSTEM*

Curriculum Revision No:	0	Board of Studies recommendation date:	06.10.2022	Academic Council Approved date:	08.10.2022
Salient Points of the revision	01.	The course "Biology for Engineers" is introduced in I Semester. It is very much important for engineering students to understand the problems related to biosystems. It is an emerging interdisciplinary field that focuses on the application of engineering principles for the analysis and solving problems of plant, animal, or microbiological with man-made machines, structures, processes, and instruments.			
	02.	The courses "Scientific Thoughts in Tamil" in Semester I and "Heritage of Tamil" in Semester II are introduced as per the recommendations of Anna University/Government of Tamil Nadu.			
	03.	The course "Computer Aided Engineering Drawing" is introduced in Semester I combining the subject "Engineering Drawing" and "Computer Aided Drafting Laboratory" of R2018 in view of making the students understand the basic concepts of Engineering Drawing effectively.			
	04.	The course "Computer Programming and Practice" is introduced in Semester II combining the subject "Programming for Problem Solving" and "Programming for Problem Solving Laboratory" of R2018 in view of making the students understand the basic concepts of Computer Programming effectively.			
	05.	The course "Production Processes" is shifted to Semester II from Semester III of R2018 and the course in Semester II "Applied			

	<p>Mechanics" of R2018 is shifted to Semester III. This will help Lateral entry students to revisit Engineering Mechanics which an important subject for Automobile students during the study of Vehicle Dynamics, Finite Element Analysis, Mechanics of Machines, etc.</p>
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**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- I. PEO1: To apply technical and professional skills in Automobile Engineering to meet the demanding and growing challenges of the industries.
- II. PEO2: To apply professional and interpersonal skills by continuously focusing on learning towards higher education and research.
- III. PEO3: To direct learners to become successful entrepreneurs by inculcating professionalism, responsibility, and ethics.

**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. PSO1: Apply the concepts of theory of automotive powertrain and to design and develop the modern engines, transmission systems and alternative propulsion systems.
14. PSO2: Apply the concepts of various subsystems to design and analyze the performance of brakes, suspension, steering and electrical/electronic components.

### PEOs-POs & PSOs MAPPING:

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

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

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

**CURRICULUM FOR SEMESTERS I TO II AND SYLLABI FOR**  
**SEMESTERS I AND II**

**SEMESTER I**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Periods	Prerequisite	Position
				L	T	P	C			
1.	IP22151	Induction Programme (Common to all Branches)		--	--	--	--		Nil	F
<b>THEORY</b>										
2.	HS22151	Tamil Language and Heritage of Ancient Tamil Society (Common to all Branches)	MC	1	0	0	1	1	Nil	F
3.	HS22152	Communicative English (Common to all Branches)	HS	3	0	0	3	3	Nil	F
4.	MA22151	Applied Mathematics I (Common to all Branches except MR)	BS	3	1	0	4	4	Nil	F
5.	PH22152	Engineering Physics (Common to AE, CE, ME, MN, MR)	BS	3	0	0	3	3	Nil	F
6.	CY22152	Engineering Chemistry (Common to AE, ME, MN)	BS	3	0	0	3	3	Nil	F
7.	BT22101	Biology for Engineers (Common to BT, AE, IT)	BS	3	0	0	3	3	Nil	F
8.	AE22101	Computer Aided Engineering Drawing	ES	3	0	2	4	5	Nil	F
<b>PRACTICAL</b>										
8.	CY22161	Chemistry Laboratory (Common to all Branches except AD, CS, IT)	BS	0	0	2	1	2	Nil	F
9.	ME22162	Basic Mechanical Engineering Laboratory (Common to AE, BT, CH)	ES	0	0	2	1	2	Nil	F
<b>Total</b>				<b>19</b>	<b>1</b>	<b>6</b>	<b>23</b>	<b>26</b>		

**SEMESTER II**

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				TOTAL Periods	Prere quisite	Position
				L	T	P	C			
<b>THEORY</b>										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to all Branches)	MC	2	0	0	2	2	Nil	F
2.	HS22252	Technical English (Common to all Branches)	HS	3	0	0	3	3	Nil	F
3.	MA22251	Applied Mathematics II (Common to all Branches except MR)	BS	3	1	0	4	4	Nil	F
4.	PH22253	Engineering Materials (Common to AE, ME, MN)	BS	3	0	0	3	3	Nil	F
5.	EE22151	Basic Electrical and Electronics Engineering (Common to all Branches except CH, EE, EC)	ES	3	0	0	3	3	Nil	F
6.	AE22201	Production Processes	ES	3	0	0	3	3	Nil	F
7.	IT22251	Computer Programming and Practice (Common to AE, BT, CE, CH)	ES	2	0	2	3	4	Nil	F
<b>PRACTICAL</b>										
8.	PH22161	Physics Laboratory (Common to all Branches except BT)	BS	0	0	2	1	2	Nil	F
9.	EE22111	Basic Electrical and Electronics Engineering Laboratory (Common to all Branches except EC)	ES	0	0	2	1	2	Nil	F
<b>Total</b>				<b>19</b>	<b>1</b>	<b>6</b>	<b>23</b>	<b>26</b>		

HS22151

**தமிழ் மொழியும் தமிழர் மரபும்**  
**Tamil Language and Heritage of Ancient Tamil Society**  
(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.

**அலகு I தமிழுக்கும் தொழில் நுட்பகல்விக்கும் உள்ள தொடர்பு 3**  
**மொழி மற்றும் பாரம்பரியம்: : இந்தியாவில் உள்ள மொழிக் குடும்பங்கள்**

- திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழில் செம்மொழி இலக்கியம் - உ.வே. சுவாமிநாத ஐயர்., ஆறுமுக நாவலர் ஆகியோரின் பங்களிப்பு - தொழில் நுட்ப கல்வியில் தமிழ், மொழிக் கல்வியின் முக்கியத்துவம்.

**LANGUAGE AND HERITAGE:** Language families in India – Dravidian 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 II திணை கருத்துக்கள் 9**

**திணை கருத்துக்கள் :** - ஐந்து வகை நிலங்கள் , தமிழர்களின் தாவரங்கள் மற்றும் விலங்கினங்கள், கடவுள்கள், தொழில்கள், வாழ்க்கை முறை, பண், கூத்து, உணவு முறை - தொல்காப்பியம் மற்றும் சங்க இலக்கியங்களில் இருந்து அகம் மற்றும் புறம் கருத்து - தமிழ் அறம் கருத்து - சங்க காலத்தில் கல்வி மற்றும் எழுத்தறிவு - பண்டைய நகரங்கள் மற்றும் சங்க காலத்தில் துறைமுகங்கள் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - சோழ மன்னர்களின் வெளிநாட்டு வெற்றிகள்.

**Thinai Concepts :** - Five types of lands, animals, Gods, occupation, life styles, music, dance, food style, Flora 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 Cholas.

**அலகு III தமிழரின் மரபு 3**

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

**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.

**TOTAL: 15 PERIODS**

**பாடநெறிமுடிவுகள்:**

பாடத்திட்டத்தின் வெளிப்பாடு		RBT LEVEL
CO1	மாணவர்கள் தமிழ் மொழி தோற்றம் பற்றி தெரிந்து கொள்வார்கள்.	1
CO2	தமிழர்களின் வாழ்வியல் முறைகளை தெரிந்து கொள்வார்கள்.	2
CO3	தமிழர்களின் சுதந்திர போராட்ட வீரர்களை பற்றியும் , மேலாண்மை முறைகளை பற்றியும் தெரிந்து கொள்வார்கள்.	2

**பாடநூல்கள்:**

1. பொன். முத்துகுமாரன் (2002), “தமிழ் மரபு”, காந்தளகம், 68, அண்ணா சாலை, சென்னை 600 002.
2. பி. டி ஸ்ரீனிவாச ஐயங்கார் (தமிழக்கமும் திறனாய்வும்) புலவர் கா. கோவிந்தன் (1988), "தமிழர் வரலாறு (முதல் பகுதி)", திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூற்பதிப்பு கழகம், 154, TTK சாலை, சென்னை 18.
3. டாக்டர் கே கே பிள்ளை (2009), “தமிழக வரலாறு மக்களும் பண்பாடும்”, உலக தமிழாராய்ச்சி நிறுவனம், தரமணி, சென்னை 600113
4. முனைவர். ச. இராஜேந்திரன் (2004), "தமிழில்சொல்லாக்கம்", தஞ்சாவூர் தமிழ் பல்கலைக் கழகம்வெளியீடு.



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' skill to write on topics of general interest and drafting correspondences for general purposes.

**UNIT I****9**

**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**

**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**

**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**

**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**

**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****OUTCOMES:**

Course Outcomes		RBT LEVEL
Upon successful completion of the course, the students should be able to:		
<b>CO1</b>	Acquire adequate vocabulary for effective communication.	<b>3</b>
<b>CO2</b>	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	<b>3</b>
<b>CO3</b>	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	<b>4</b>
<b>CO4</b>	Comprehend conversations and short talks delivered in English.	<b>6</b>
<b>CO5</b>	Write short write-ups and personal letters and emails in English.	<b>6</b>

**REFERENCES:**

1. Department of English, Anna University, "Mindscapes: English for Technologists and Engineers". Orient Black Swan, Chennai, 2017.
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.

**Web Link:**

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. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017
2. English Advance Vocabulary - Cambridge University Press
3. Face2Face Advance - Cambridge University Press, 2014
4. IELTS test preparation - Cambridge University Press 2017
5. Official Guide to the TOEFL Test With CD-ROM, 4<sup>th</sup> Edition

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>1.</b>										3				
<b>2.</b>										3				
<b>3.</b>										3				
<b>4.</b>										3				
<b>5</b>										3				
<b>Average</b>										<b>3</b>				

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



**TEXTBOOKS:**

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", Ninth Edition, Laxmi Publications Pvt. Ltd., 2014.
2. Glyn James, "Advanced Modern Engineering Mathematics", 4<sup>th</sup> Edition, Pearson Education, 2016.
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2013.

**Web Link:**

1. <https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf>
2. <https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf>

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3								3	2	
2.	3	3										3		
3.	3	3	3	3								3	2	
4.	3	3										3	1	
5.	3	3	2	2								3	1	
<b>Average</b>	<b>3</b>	<b>3</b>	<b>2.67</b>	<b>2.67</b>								<b>3</b>	<b>1.5</b>	

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

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. 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 fibers (material, refractive index, and mode) - losses associated with optical fibers - Fiber optic communication - fiber 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 - interplanar 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.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Course Outcomes		RBT LEVEL
CO1	Gain knowledge in Mechanics.	2
CO2	Evaluate the concepts of properties of matter and thermal physics.	3
CO3	Learn to solve the issues related to defects in the buildings due to acoustic design and the significance of ultrasonic waves.	3
CO4	Develop an understanding about photonics and Fiber Optic communication system.	2
CO5	Classify and demonstrate the fundamentals of crystals and their defects.	3

**TEXTBOOKS:**

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

**REFERENCES:**

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

**COURSE ARTICULATION MATRIX**

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

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

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. To make the students to understand the importance of electrochemistry.
2. To appreciate the concepts of photochemistry and spectroscopy.
3. To impart knowledge on nanotechnology.
4. To understand the applications of engineering materials.
5. To familiarize the manufacture of fuels.

**UNIT I ELECTROCHEMISTRY 9**

Electrodes and electrochemical cells - electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes - calomel, quinhydrone and glass electrode. Nernst equation - determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries - Primary (dry battery) and secondary batteries (Lead - acid storage battery and Lithium ion battery) and next generation batteries.

**UNIT II PHOTOCHEMISTRY 9**

Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert Beer Law - determination iron by spectrophotometer. Quantum efficiency - Photo physical processes - internal conversion, inter-system crossing, fluorescence, phosphorescence and photo-sensitization-quenching of fluorescence and its kinetics, Stern - Volmer relationship. Applications of photochemistry.

**UNIT III NANOCHEMISTRY 9**

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications - Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

**UNIT IV ENGINEERING MATERIALS 9**

Abrasives: definition, classification, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties - refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Lubricants - classification, properties and applications. Basics of composite materials, properties and applications.

**UNIT V FUELS AND COMBUSTION 9**

Fuel: Introduction - classification of fuels - calorific value - higher and lower calorific values - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - refining - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - producer gas - water gas. Combustion of fuels: introduction - theoretical calculation of calorific value - calculation of stoichiometry of fuel and air ratio - flue gas analysis (ORSAT Method) - Uses of catalytic converters.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Course Outcomes		RBT LEVEL
On the successful completion of the course, students will be able to:		
CO1	Identify electrochemical cells, corrosion and fundamental aspects of batteries.	2
CO2	Interpret the photochemical reactions and make use of spectroscopic techniques.	2
CO3	Realize the structures, properties and applications of nanoparticles.	2
CO4	Acquire knowledge on the basic properties of engineering materials and its applications.	2
CO5	Illustrate the various types of fuels, its calorific value and significance of flue gas analysis.	3

**TEXTBOOKS:**

1. Jain P.C., and Monica Jain, "Engineering Chemistry", Dhanpat Rai & Sons, New Delhi, 17<sup>th</sup> Edition, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.

**REFERENCES:**

1. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2. Puri B.R., Sharma L.R., Pathania M.S., "Principles of Physical Chemistry", 47<sup>th</sup> edition, Vishal Publishing C., Jalandhar, 2018.
3. Sony P.L., and Chawla H.M., "Text Book of Organic Chemistry", Sultan Chand and Sons Publishers, New Delhi, 2000.

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	2	3								3		
2.	3	3				3	3					3	3	
3.	3	3	2			3	3	3				3	2	
4.	3	3		3			3	3				3	1	
5.	3	3		3		3		3				3		
<b>Average</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>		<b>3</b>	<b>3</b>	<b>3</b>				<b>3</b>	<b>2</b>	

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



**BT22101**

**BIOLOGY FOR ENGINEERS**  
(Common to BT, AE, IT)

<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:**

1. To illustrate the unit of life and its function..
2. To study the implications of engineered products and process on living matters.
3. To understand biological function for the application in the product and process engineering.
4. To discuss the impact of the machine on human.
5. To understand the regulation and ethics.

**UNIT I INTRODUCTION TO BIOLOGY 8**

Origin of life and Evolution, Cells - Prokaryotes and Eukaryotes, Biochemical nuts and bolts - water, carbohydrates, lipids, proteins, DNA, RNA and enzymes, Introduction to metabolism, Mendelian genetics, Chromatin, DNA structure, replication, transcription and translation. Human system - skeletal structure, types of connective tissues, structure of joints, muscle and organ structure and function, cardiac physiology, blood properties and flow, nervous system. Plant system - organization of plants, Photosynthesis and Respiration, Growth and Development Hormones. Microbial system - Bacteria, yeast, fungi, protozoan, Algae and virus.

**UNIT II APPLICATION OF BIOLOGICAL PRINCIPLES IN ENGINEERING 12**

Biological functions for Camera for imaging, image recognition, visual information processing, Information and Communication Technologies, memristor, optoelectronic, speech recognition, smart sensing, sensorimotorics, neuromorphic and artificial intelligence. Biology in biomimicry - Sharkskin inspired swimsuits, Burr inspired Velcro, Whale fin inspired wind turbine blades, cooling fans, airplane wings and propellers, lotus inspired paintbrushes, Stenocara shell inspired water collection, skeleton structure of blowfish inspired designing of vehicles, termites and Scyliorhinus canicular inspired architecture and natural colour inspired nanophotonic crystal.

**UNIT III BIOLOGICALLY INSPIRED PRODUCTS, PROCESS, AND MATTERS 12**

Case study on workload ergonomics, system ergonomics and information ergonomics, Ultrasound imaging, X-Ray and PET scanning, Bioelectromagnetism - Touch Screen Technology, Force and torque sensor, inertial sensing technology and motion capture systems, Human-in-the-loop process, Bioactuators, Biocybernetics, Biotelemetry, Bionic (rehabilitation), Bioreactor, Bioremediation, Biofertilizer, Bioenergy, Biosensors, Biopolymers, Biofilters, Biochips, Microbial fuel cells in vehicles. Biotechnological reliance in space, agriculture and nuclear energy.

**UNIT IV IMPACT OF MACHINE/DEVICES ON HUMAN 5**

Biological effects - Somatic and genetic effect, Exposure and health effects - microwaves, radiation, radiofrequency and electronic gadgets, Man-made and Technological hazards, Impact on ecosystem - Chemical, nuclear, radiological, transportation and e-waste hazards.

**UNIT V REGULATIONS 8**

International and National regulatory bodies - Radiation in the electromagnetic spectrum, Electronic devices, Cell phones, Smart meters, Medical use of radiation and Nuclear power plants, Labeling Regulatory Requirements for Medical Devices, Ethics and privacy cameras and surveillance system, Regulation of Human Cloning and Embryonic Stem Cell Research, Privacy and ethical issues in 3D whole body scanning, Regulation of emerging gene technologies.

**TOTAL: 45 PERIODS**

## OUTCOMES:

Course Outcomes		RBT LEVEL
After completion of this course the students will be able to:		
CO1	Distinguish the structure and function of prokaryotic and eukaryotic cells.	4
CO2	Explains the usage of biological principles in engineering.	2
CO3	Integrate the concepts of biology with engineering through case studies.	3
CO4	Describe the influence of biologically inspired materials/machines/devices on environment and society.	2
CO5	Understand the regulations, ethics, security and safety of engineering applications.	2

## TEXTBOOKS:

1. Johnson, A.T., "Biology for engineers", CRC Press, 2011.
2. Khandpur, R.S., "Biomedical instrumentation: Technology and applications", Vol. 1, New York: Mcgraw-hill, 2005.
3. Salvendy, G., "Handbook of human factors and ergonomics", 4<sup>th</sup> edition, John Wiley & Sons, 2012.
4. Vaccari, D.A., Strom, P.F., & Alleman, J.E., "Environmental biology for engineers and scientists", Vol. 7, p. 242, New York: Wiley-Interscience, 2006.
5. Waite, G.N., & Waite, L.R. "Applied cell and molecular biology for engineers", McGraw-Hill Education, 2007.

## REFERENCES:

1. Kindt, T.J., Goldsby, R. A., Osborne, B. A., & Kuby, J., "Kuby immunology", Macmillan, 2007.
2. Nelson, D.L., Lehninger, A.L., & Cox, M.M., "Lehninger principles of biochemistry", Macmillan, 2008.
3. Subrahmanyam, S.A., "Textbook Of Human Physiology", S. Chand Limited, 1987.

## COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2											1		
2.	3	2				1							1	1
3.		2	1			2				2		1		
4.		1		2			3						1	1
5.						3	3	3				1	1	1
Average	2.5	1.7	1	2		2	3	3		2		1	1	1

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>2</b>	<b>4</b>

**COURSE OBJECTIVES:**

1. To introduce students concept of Engineering Drawing and build their ability to read drawings.
2. To interpret the position and form of simple geometry, culminating into understanding of simple technical assemblies.
3. To provide the students with the fundamentals of Computer Aided Drafting (CAD) software package to draw 2D projections and 3D models.

**UNIT 0          ENGINEERING DRAWING FUNDAMENTALS (Not for Examination)          (2+3)**

Drawing standard: BIS, Lettering, ASME Y14.5 dimensioning and tolerancing, Types of lines, Conventions, Geometrical constructions using drawing tools. Study the capabilities of CAD software for Drafting and Modeling - Coordinate systems - Drafting of simple geometries like polygon and general multi-line figures. Construction of Title block manually and CAD software.

**UNIT I          CURVES AND PROJECTION OF POINTS AND LINES          (6+12)**

Construction and drafting of Engineering Curves: Cycloid, Involute of Circle and Pentagon.

Projection: Principal Planes, Projections of Points using Four Angles of Projection - Projection of Straight Lines parallel and inclined to one or both planes using Rotating Line Method in First Angle Projection.

Computer Drafting of Projection of Straight lines using Rotating Line Method in First Angle Projection.

**UNIT II          PROJECTION OF PLANES AND SOLIDS          (6+12)**

Projection of Plane Figures (Manual and using CAD software) - Inclined to any one Principal Plane.

Projections and drafting of orthographic views of Solids (Manual and using CAD software) - Simple Solids (Prisms, Pyramids, Cone and Cylinder) when the axis is inclined to any one Principal Plane.

**UNIT III          SECTION OF SOLIDS & DEVELOPMENT OF SURFACES          (6+12)**

Introduction to Conic sections (Manual and using CAD software) - Sections of Solids and drafting the sectional views of simple vertical solids when the solids are cut by section plane inclined to any one Principal Plane.

Development of Surfaces (Manual and using CAD software) of simple solids.

**UNIT IV          PICTORIAL PROJECTION          (6+12)**

Introduction to Pictorial Projection - Isometric Projection - Principle, Isometric Planes, Isometric Scales - Isometric Projection of simple solids (Manual and using CAD software).

Free Hand Drawing - Orthographic Projection - Orthographic views of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views.

Creation of 3D models of Simple Solids using Isometric Principles from orthographic views using CAD software.

**UNIT V          PERSPECTIVE PROJECTION          (4+9)**

Perspective Projection of solids in simple positions with respect to projection planes - Creation of 3D models of simple solids by visual ray method (Manual and using CAD software).

**TOTAL(L:30+T:60): 90 PERIODS**

**OUTCOMES:**

Course Outcomes		RBT LEVEL
CO1	Perform the sketching of basic geometrical constructions and Draw orthographic projections of lines, plane surfaces and solids.	3
CO2	Draw the views of sectioned surfaces and development of surfaces of simple solids.	3
CO3	Prepare isometric and perspective sections of simple solids.	3
CO4	Draw the 2D sketches of lines, planes and simple solids from their orthographic projections using the different commands in CAD software.	3
CO5	Model the 3D views of solids applying isometric and perspective projection principles using the different commands in CAD software.	4

**TEXTBOOKS:**

1. Bhatt N.D, Panchal Pramod V.M and Ingle R, "Engineering Drawing", Charotar Publishing House, 2014.
2. Gopalakrishna K.R., Sudhir Gopalakrishna, "Textbook Of Computer Aided Engineering Drawing", Subhas Publications, 2017.

**REFERENCES:**

1. George Omura and Brian C. Benton, "Mastering AutoCAD 2016 and AutoCAD LT 2016: Autodesk Official press", Wiley Publishers, 2015.
2. Gopalakrishna K.R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2017.
3. Gowri S and Jeyapoovan T, "Engineering Graphics", Vikas Publishing House Pvt. Ltd., 2019.
4. James D. Bethune, "Engineering Graphics with AutoCAD 2017", PEACHPIT Press, 2016.
5. Natrajan K.V, "A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
6. Venugopal. K and Prabhu Raja. V, "Engineering Graphics", New Age International (P) Limited, 2009.

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3					3			3	2
2.	3	3	3	3	3					3			2	2
3.	3	3	3	3	3					3			2	2
4.	3	3	3	3	3					3				
5.	3	3	3	3	3					3			3	3
Average	3	3	3	3	3					3			2.5	2.25

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 phenomenon/concepts of chemistry, the student face during course of their study 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 polymer 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 hydrochloric acid using pH meter.
3. Determination of 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: 30 PERIODS**

**OUTCOMES:**

<b>Course Outcomes</b>		<b>RBT LEVEL</b>
Upon successful completion of the course, students should be able to:		
<b>CO1</b>	Distinguish hard and soft water, solve the related numerical problems on water, purification and its significance in industry and daily life.	<b>3</b>
<b>CO2</b>	Interpret the knowledge of instruments to measure potential and current related parameters.	<b>2</b>
<b>CO3</b>	Demonstrate the basic principle for separation of components using paper chromatography.	<b>3</b>
<b>CO4</b>	Evaluate the molecular weight of polymer using Ostwald's/Ubbelohde viscometer.	<b>3</b>

## 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

## REFERENCES:

1. Daniel R. Palleros, "Experimental organic chemistry", John Wiley & Sons, Inc., New York 2001.
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore 1994.
3. Jeffery G.H., Bassett J., Mendham J. and Denny Vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5<sup>th</sup> Edn. Longman, Singapore publishers, Singapore, 1996.
4. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.

## COURSE ARTICULATION MATRIX

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1.	3	2				3	3	3	1			1	2	1	1
2.	3	2	1			3	3	3						1	1
3.	3					3	3					2		1	1
4.	3			1		3	3	3						1	1
<b>Average</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>		<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>			<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>

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

ME22162

**BASIC MECHANICAL ENGINEERING LABORATORY**  
(Common to AE, BT, CH)

<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:**

1. To provide exposure and hands on experience to the students on various basic mechanical engineering processes.

**LIST OF EXPERIMENTS:**

1. Welding - Butt joint and lap joint using Electric Arc and Gas welding.
2. Machining - Turning and facing using Centre Lathe.
3. Sheet metal work - Making of a cylinder using GI sheet and finishing using rivets.
4. Drilling and Tapping - Drilling of holes precisely and making internal threads by Tapping for various sizes.
5. Casting - Mould preparation using simple solid pattern and casting.
6. Plumbing - Making household pipeline PVC pipes, valves, taps, couplings, unions, reducers, elbows.
7. Fuel testing - Determination of Flash point and Fire point of fuels.
8. Refrigeration and Air Conditioning - Determination of Coefficient of Performance (COP) of refrigeration and air conditioning systems.
9. Automation - Basic pneumatic circuit using single and double acting cylinder.
10. 3D printing - Demonstration of printing of simple solids using Additive Manufacturing/3D printing..

**TOTAL: 30 PERIODS****OUTCOMES:**

<b>Course Outcomes</b>		<b>RBT LEVEL</b>
<b>CO1</b>	Students will be able to <i>Fabricate</i> components by various manufacturing processes.	<b>3</b>
<b>CO2</b>	Students will be able to <i>Prepare</i> pipeline for a given application.	<b>3</b>
<b>CO3</b>	Students will be able to <i>Evaluate</i> the ignition properties of fuels.	<b>3</b>
<b>CO4</b>	Students will be able to <i>Determine</i> the efficiency of refrigeration and air conditioning systems.	<b>3</b>
<b>CO5</b>	Students will be able to <i>Understand</i> the principles of low cost automation using pneumatic circuits.	<b>2</b>
<b>CO6</b>	Students will be able to <i>Understand</i> the principle of additive manufacturing/3D printing.	<b>2</b>

**REFERENCES:**

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education, 7<sup>th</sup> edition, 2009.
2. Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
3. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.

4. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
5. Jeyapooan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab Manual", Vikas Publishing House Pvt.Ltd, 2006.
6. Mechanical engineering practices lab manual, SVCE, 2022.
7. Rajput. R.K., "Thermal Engineering", Laxmi Publications, Tenth Edition, 2017.

#### LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS

S. No.	Equipment	Qty.
1	Welding transformers, booths with exhaust and Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 sets
2	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 sets
3	Centre lathe	2
4	Standard GI sheet working tools	10 sets
5	Drilling machine	2
6	Taps (various sizes)	5
7	Furnace	1
8	Moulding tools and accessories	5 sets
9	Assorted components for plumbing consisting of pipes, couplings, unions, elbows, plugs and other fittings.	15 sets
10	Flash point and fire point apparatus	1
11	Refrigeration and Air conditioning testing setup	1
12	Basic Pneumatic trainer kit	1
13	3D printing machine	1

#### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2												1	1
2.	2													
3.	2												3	
4.	2												2	
5.	1				2									1
6.	1				2								2	2
<b>Average</b>	<b>1.7</b>				<b>2</b>								<b>2</b>	<b>1.3</b>

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



HS22251

**அறிவியல் மற்றும் தொழில்நுட்பத்தில் 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.

**அலகு I**

**அறிவியலில் தமிழ்**

3

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

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

**அலகு II**

**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.

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

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

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

**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.

**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.

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

**Tamil Computing :** Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project.

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

Future of Tamil and Information Technology- Globalization and Information Technology - Teaching Tamil for Computer - Resources in Tamil Language Technology.

**TOTAL: 30 PERIODS**

**பாடநெறிமுடிவுகள்:**

பாடத்திட்டத்தின் வெளிப்பாடு		RBT LEVEL
CO1	அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.	2
CO2	பல்வேறு தொழில்நுட்பத்தில் தமிழ் மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்.	3

**பாடநூல்கள்:**

1. டாக்டர், வா-செ .குழந்தைசாமி ( 1985), " அறிவியல் தமிழ் " , பாரதி பதிப்பகம் , 126/108, உஸ்மான் சாலை, தியாகராய நகர், சென்னை 600017.
2. சுப. திண்ணப்பன், (1995), "கணினியும் தமிழ்கற்பித்தலும்", புலமைவெளியீடு, 38-Bமண்ணத்தோட்டத்தெரு, ஆழ்வார்பேட்டை, சென்னை 600018.
3. மு. பொன்னவைக்கோ, (2003), "வளர்தமிழில் அறிவியல்-இணையத்தமிழ்", அனைத்திந்திய அறிவியல் தமிழ்க்கழகம், தஞ்சாவூர் 615 005.
4. துரை. மணிகண்டன், (2008), "இணையமும் தமிழும்", நல்நிலம்பதிப்பகம், 7-3, சிமேட்லிசாலை, 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**

**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**

**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**

**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**

**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 evidences 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**

**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 topnotch 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/improvising ideas).

**TOTAL: 45 PERIODS**

## OUTCOMES:

Course Outcomes		RBT LEVEL
Upon successful completion of the course, the students should be able to:		
CO1	Understand the nuances of technical communication and scientific writing.	3
CO2	Present papers and give seminars.	6
CO3	Discuss in groups and brainstorm.	6
CO4	Draft business correspondences and write for documenting purposes.	6
CO5	Face job interviews with confidence.	6

## REFERENCES:

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

## Web Link:

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. CAMBRIDGE Preparation for the TOEFL TEST - Cambridge University Press, 2017.
2. English Advance Vocabulary - Cambridge University Press.
3. Face2Face Advance - Cambridge University Press, 2014.
4. IELTS test preparation - Cambridge University Press, 2017.
5. Official Guide to the TOEFL Test With CD-ROM, 4<sup>th</sup> Edition.

## COURSE ARTICULATION MATRIX

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

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

L	T	P	C
3	1	0	4

**COURSE OBJECTIVES:**

**The student should be made to:**

1. Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
2. Skilled at the techniques of solving ordinary differential equations that model engineering problems.
3. Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
4. Explain geometry of a complex plane and state properties of analytic functions.
5. Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

**UNIT I VECTOR CALCULUS (9+3)**

Gradient, divergence and curl - Directional derivative - Vector identities - Irrotational and solenoidal vector fields - Line integral over a plane curve - Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) - Verification and application in evaluating line, surface and volume integrals.

**UNIT II ORDINARY DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS (9+3)**

Differential equations of first order - Equations of the first order and first degree - Linear equations - Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients - Applications of Linear differential equations - Oscillatory electrical circuit - Deflection of beams.

**UNIT III LAPLACE TRANSFORM (9+3)**

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions - Basic properties - Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem - Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**UNIT IV ANALYTIC FUNCTIONS (9+3)**

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping - Mapping by functions  $W = Z + C$ ,  $CZ$ ,  $1/Z$ ,  $Z^2$  - Joukowski's transformation - Bilinear transformation.

**UNIT V COMPLEX INTEGRATION (9+3)**

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem - Application of residue theorem for evaluation of real integrals - Use of circular contour and semi-circular contour.

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

## OUTCOMES:

Course Outcomes		RBT LEVEL
Upon completion of the course, students will be able to:		
CO1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	3
CO2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations.	3
CO3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.	3
CO4	Explain Analytic functions and Categorize transformations.	3
CO5	Perform Complex integration to evaluate real definite integrals using Cauchy integral theorem and Cauchy's residue theorem.	3

## TEXTBOOKS:

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 Textbook of Engineering Mathematics", 9<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd., 2014.
2. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Ltd., 2011.
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2013.

## 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
1.	3	3	2	2								3	1	1
2.	3	3	3	3								3	3	3
3.	3	3	3	3								3	3	3
4.	3	3										3		
5.	3	3										3	1	
Average	3	3	2.33	2.33								3	2	2.3

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

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. To impart the knowledge about the properties of engineering and ceramic materials to the students.
2. To enhance the knowledge about the electron behaviour in the semiconductor and dielectric materials.

**UNIT I PHASE DIAGRAMS AND NON-FERROUS ALLOYS 8**

Solid solutions - Hume Rothery's rules - Phase rule - single component system - one-component system of Iron - binary phase diagrams - Isomorphous systems - Tie-line rule - the Lever rule - application to Isomorphous system - Cu - Ni system - Eutectic phase diagram - Peritectic phase diagram - other invariant reactions - Cu - Zn system - Microstructural change during cooling.

**UNIT II FERROUS ALLOYS AND HEAT TREATMENT 10**

**Fe-C equilibrium diagram:** phases, invariant reactions - microstructure of slowly cooled steels - Eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - **Diffusion in solids:** Fick's laws - phase transformations - T-T-T-diagram for eutectoid steel - Pearlite, Bainitic and Martensitic transformations - tempering of Martensitic.

**Heat treatment of steels:** Annealing - Normalizing - Quenching and Tempering - Casehardening - Induction, Flame and Laser hardening - Carburizing, Cyaniding, Carbonitriding and Nitriding.

**UNIT III SEMICONDUCTING MATERIALS 8**

Introduction - classification of materials based on band theory (metals, semiconductors and insulators) - intrinsic and extrinsic semiconductors - carrier concentration in intrinsic semiconductor (derivation) - effect of temperature on Fermi level - compound semiconductors - variation of electrical conductivity in intrinsic semiconductors with temperature - Band gap determination of intrinsic semiconductor (derivation and experiment) - Hall effect (derivation and experiment).

**UNIT IV DIELECTRIC, MAGNETIC AND SUPERCONDUCTING MATERIALS 10**

**Dielectric materials:** Dielectric constant - Polarization of dielectric materials - Types of Polarization (Polarisability) - Equation of internal fields in solid (One-Dimensional) (Derivation) - Clausius-Mosotti Relation for elemental dielectric materials - Dielectric Breakdown - Frequency dependence of dielectric constant, Dielectric Losses - Important applications of dielectric material.

**Magnetic materials:** Dia, Para and Ferro magnetic material - Domain theory for Ferro magnetic materials - Phenomena of Hysteresis and its applications - Ferrites and its structures.

**Introduction to Superconductivity:** Meissner effect - Properties of superconductors - Type I and Type II superconductors - BCS theory (Qualitative) - Low T<sub>c</sub> and High T<sub>c</sub> (alloy) superconductors - Ceramic superconductors (oxide superconductors) - Applications of Superconductors.

**UNIT V CERAMIC AND NEW MATERIALS 9**

**Ceramics:** types and applications, **Composites:** Ceramic Fibres - Fibre reinforced Plastics - Fibre reinforced Metal - **Metallic glasses:** preparation, Properties and applications - **Shape memory alloys:** shape memory effect, phases, pseudo elastic effect, NiTi alloy, Properties and applications - **Nanomaterials:** preparation, properties and applications.

**TOTAL: 45 PERIODS**

## OUTCOMES:

Course Outcomes		RBT LEVEL
Students will be able to:		
CO1	Demonstrate about the Phase diagrams of various alloys	3
CO2	Enhance knowledge about the heat treatment of alloys and alloy steels.	3
CO3	Demonstrate an understanding of various properties of Semiconducting materials and their internal structure	3
CO4	Summarize basics of magnetism and superconductivity. Explore a few of their technological applications. Analyse the properties of dielectric materials and apply them in various fields.	3
CO5	Develop an understanding about ceramics and various new engineering materials	2

## TEXTBOOKS:

1. Arumugam. M, "Materials Science", Anuradha Publications, 2015.
2. Raghavan. V, "Materials Science and Engineering - A first course", Sixth Edition, PHI publications, 2015.
3. Rajendran. V, "Engineering Physics", Tata McGraw Hill, 2015.
4. Suresh. R and Jayakumar. V, "Materials Science", Lakshmi Publications, 2003.

## REFERENCES:

1. Avadhnaulu. M.N and Kshirsagar, "A Text book of Engineering Physics", S. Chand & Co. 2006.
2. Azaroff. L.V and Brophy. J.J, "Electronic Processes In Materials", McGraw Hill., 1963.
3. Gaur. R.K and Gupta. S.L, "Engineering Physics", Dhanpat Publications, 2015.
4. Kittel. C, "Introduction to Solid State Physics", 7<sup>th</sup> Edition, Wiley Eastern Ltd., 2004.

## COURSE ARTICULATION MATRIX

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

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



**EE22151****BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING**

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

(Common to all Branches except CH, EE, EC)

**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 its applications.
4. To explain the principles of digital electronics.
5. To impart knowledge on the principles of measuring instruments.

**UNIT I ELECTRICAL CIRCUITS 9**

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.

**UNIT II ELECTRICAL MACHINES 9**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 9**

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.

**UNIT IV DIGITAL ELECTRONICS 9**

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.

**UNIT V MEASURING INSTRUMENTS 9**

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****OUTCOMES:**

<b>Course Outcomes</b>		<b>RBT LEVEL</b>
<b>CO1</b>	Compute the electric circuit parameters for simple problems.	<b>4</b>
<b>CO2</b>	Understand the construction and characteristics of different electrical machines.	<b>4</b>
<b>CO3</b>	Describe the fundamental behavior of different semiconductor devices and circuits.	<b>4</b>
<b>CO4</b>	Design basic digital circuits using Logic Gates and Flip-Flops.	<b>4</b>
<b>CO5</b>	Analyze the operating principle and working of measuring instruments.	<b>4</b>

**TEXTBOOKS:**

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2. Mehta VK, "Principles of Electronics", S. Chand & Company Ltd, 2010.
3. Sedha R.S., "A Text Book of Applied Electronics", S. Chand & Co., 2014.

**REFERENCES:**

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

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3			2					2	1	1
2.	3	3	3	3			2					2	2	2
3.	3	3	3	3			2					2	2	2
4.	3	3	3	3			2					2	1	1
5.	3	3	3	3			2					2	1	1
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>			<b>2</b>					<b>2</b>	<b>1.4</b>	<b>1.4</b>

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

L	T	P	C
3	0	0	3

**COURSE OBJECTIVES:**

1. To introduce the concepts of basic manufacturing processes and fabrication techniques such as metal casting, metal joining, metal forming and manufacture of plastic components.

**UNIT I CASTING 9**

Casting steps, types of pattern, core making, Cupola and Induction furnaces, procedure to make sand mould, moulding tools, machine moulding, special moulding processes - CO<sub>2</sub> moulding, shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

**UNIT II WELDING 9**

Classification of welding processes. Principles of Oxy-acetylene gas welding. AC metal arc welding, resistance welding, submerged arc welding, tungsten inert gas welding, metal inert gas welding, plasma arc welding, thermit welding, friction welding, electron beam welding, laser beam welding, defects in welding, soldering and brazing.

**UNIT III METAL FORMING AND POWDER METALLURGY 9**

Hot and Cold working - Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing.

Powder metallurgy - Principal steps involved advantages, disadvantages and applications of powder metallurgy.

**UNIT IV SHEET METAL PROCESSES 9**

Sheet metal characteristics - shearing, bending and drawing operations - Stretch forming operations - Formability of sheet metal - Test methods - Special forming processes - Metal spinning - Explosive forming, Magnetic pulse forming, Electro-Hydraulic forming, Super plastic forming - Micro forming.

**UNIT V PLASTIC MATERIALS AND PROCESSES 9**

Types of plastics - Characteristics of the forming and shaping processes - Injection moulding - Blow moulding - Rotational moulding - Film blowing - Extrusion - Thermoforming - Compression moulding - Transfer moulding - typical industrial applications, Laminated plastics. Bonding of Thermoplastics - Fusion and solvent methods - Induction and Ultrasonic methods.

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

Course Outcomes		RBT LEVEL
Students will be able to:		
CO1	Select the best casting process for a component to be manufactured based on the economy of manufacture and its application	3
CO2	Identify the best joining process involved in the fabrication of components based on the simplicity, application and cost	3
CO3	Choose the best metal forming or powder metallurgy process for a component to be manufactured based on the economy of manufacture and its application	3

<b>CO4</b>	Select the best sheet metal process for a component to be manufactured based on its application	<b>3</b>
<b>CO5</b>	Choose the best method of moulding/joining of plastics of a part based on cost and its use.	<b>3</b>

#### TEXTBOOKS:

1. Hajra Choudhary S K, Hajra Choudhury A K and Nirjhar Roy, "Elements of workshop Technology", Volume I, Media promoters & Publishers Pvt. Ltd., Mumbai, 2008.
2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013.

#### REFERENCES:

1. Jain R.K., "Production Technology", 21<sup>st</sup> Edition, Khanna Publishers, 2005.
2. Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing", 8<sup>th</sup> Edition, Prentice-Hall of India, 1997.
3. Rao, P.N. "Manufacturing Technology: Foundry, Forming and Welding", 4<sup>th</sup> Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2017.
4. Roy. A. Lindberg, "Processes and Materials of Manufacture", Fourth Edition, PHI/Pearson Education 2015.
5. Sharma, P.C., "A Text book of Production Technology", S. Chand and Co. Ltd., 2014.

#### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>1.</b>	3	2	2			2	1	2				1	1	
<b>2.</b>	3	2	2			2	1	2				1	1	
<b>3.</b>	3	2	2			2	1	2					1	
<b>4.</b>	3	2	2			2	1	2					1	
<b>5.</b>	3	2	2			2	2	2					1	
<b>Average</b>	<b>3</b>	<b>2</b>	<b>2</b>			<b>2</b>	<b>1.2</b>	<b>2</b>					<b>1</b>	

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

IT22251

**COMPUTER PROGRAMMING AND PRACTICE**

(Common to AE, BT, CE, CH)

L	T	P	C
2	0	2	3

**COURSE OBJECTIVES:**

1. To know the basics of algorithmic problem solving.
2. To learn programming using a structured programming language.
3. To implement programs with basic features of C.

**UNIT I FUNDAMENTALS OF COMPUTING (6+3)**

Computing Devices - Identification of Computational Problems - Algorithms - Building Blocks of Algorithms - Pseudocodes and Flowcharts - Notion of memory, addresses, variables, instructions, execution of instructions - Operating system commands, file editing, compiling, linking, executing a program, Introduction to different programming languages.

**Suggested Activities:**

**Practical**

Use of operating system commands and file editing operations.

**UNIT II BASICS OF C (6+9)**

Data types - constants, variables - operators - expressions - basic input/output. Statements and blocks - Selection - if-else construct - iteration - while - for constructs.

**Suggested Activities**

**Practical**

Demonstration of programs using data types, operators and basic input/output.

Demonstration of programs using if-else, else-if, switch.

Demonstration of programs using while, for, do-while, break, continue.

**UNIT III ARRAYS AND STRINGS (6+6)**

Array, declaration, initialization. Multi dimensional arrays. Strings and character arrays, string operations on arrays.

**Suggested Activities**

**Practical**

Demonstration of programs using arrays and operations on arrays.

Demonstration of programs implementing string operations on arrays.

**UNIT IV FUNCTIONS AND STRUCTURES (6+6)**

Functions, definition, call, arguments, call by value. Call by reference. Recursion, Introduction to structures and unions.

**Suggested Activities**

**Practical**

Demonstration of programs using functions.

Demonstration of programs using recursion.

Demonstration of programs using Structures and Unions.

**UNIT V POINTERS AND FILE HANDLING IN C (6+6)**

Introduction to Pointers - pointers to basic variables, pointers and arrays. Pointers to strings, Dynamic Memory Allocation, Files - binary, text - open, read, write, random access, close. Preprocessor directives.

## Suggested Activities

### Practical

Demonstration of programs using pointers.

Demonstration of programs using files.

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

### OUTCOMES:

Course Outcomes		RBT LEVEL
Upon successful completion of the course, the students should be able to:		
CO1	Apply appropriate programming constructs to solve problems.	3
CO2	Design, implement, test and debug programs that use the basic features of C.	5
CO3	Design modularized applications in C to solve real world problems.	6
CO4	Use C pointers and dynamically allocated memory to solve complex problems.	4
CO5	Apply file operations to develop solutions for real-world problems.	3

### TEXTBOOKS:

1. Dromey R.G., "How to Solve it using Computer", Pearson, 2006.
2. Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018.

### REFERENCES:

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGraw Hill, 2010.
2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
3. Reema Thareja, "Programming in C", 2<sup>nd</sup> ed., Oxford University Press, 2016.
4. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 2011.

### Evaluation Method

60% theory+40% practical

### COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3						2	3			2	2	2
2.	1	3						2	3			2		
3.	1		3	2	1			2	3			2	2	2
4.	1		3	2	1			2	3			2		
5.	1		3	2	1			2	3			2	1	1
Average	1	3	3	2	1			2	3			2	1.7	1.7

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

PH22161

**PHYSICS LABORATORY**  
(Common to all Branches except BT)

<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:**

1. 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 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.

**TOTAL: 30 PERIODS****OUTCOMES:**

Course Outcomes		RBT LEVEL
<b>CO1</b>	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	<b>4</b>
<b>CO2</b>	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering.	<b>3</b>
<b>CO3</b>	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering.	<b>3</b>
<b>CO4</b>	Evaluate the process and outcomes of an experiment quantitatively and qualitatively.	<b>3</b>
<b>CO5</b>	Extend the scope of an investigation whether or not results come out as expected.	<b>3</b>

**REFERENCES:**

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

**COURSE ARTICULATION MATRIX**

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>1.</b>	3	3	2	3	2				3	1		2	1	1
<b>2.</b>	3	3		3		2			3	1		2	1	1
<b>3.</b>	3	3	2	3	2	2			3	1		2	1	1
<b>4.</b>	3	3		3					3	1		2	1	1
<b>5.</b>	3	3		3	2				3	1		2	1	1
<b>Average</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>			<b>3</b>	<b>1</b>		<b>2</b>	<b>1</b>	<b>1</b>

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

EE22111

**BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING LABORATORY**  
(Common to all Branches except EC)

<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:**

1. To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
2. To introduce the students to Electrical Machines and 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:**

<b>Course Outcomes</b>		<b>RBT LEVEL</b>
<b>CO1</b>	Wiring of basic electrical system and measurement of electrical parameters.	<b>4</b>
<b>CO2</b>	Verifying the basic laws of Electric circuits and select various Electrical Machines.	<b>4</b>
<b>CO3</b>	Construct electronic circuits and design solar photovoltaic system.	<b>4</b>
<b>CO4</b>	Apply the concept of a three-phase system.	<b>4</b>
<b>CO5</b>	Construct a fixed voltage regulated power supply.	<b>4</b>

**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
1.	3	3	3	3					2			2	2	1
2.	3	3	3	3					2			2	2	1
3.	3	3	3	3					2			2	3	2
4.	3	3	3	3					2			2	1	1
5.	3	3	3	3					2			2	1	1
<b>Average</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>					<b>2</b>			<b>2</b>	<b>1.8</b>	<b>1.2</b>

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

