B.E. Mechanical Engineering (Automobile)

CURRICULUM AND SYLLABUS

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

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
THEORY										
2	HS22151	Tamil Language and Heritage of Ancient Tamil Society (Common to all Branches)	HS	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, AM, CE, ME, MN, MR)	BS	3	0	0	3	3	Nil	F
6	CY22152	Engineering Chemistry (Common to AE, AM, ME, MN)	BS	3	0	0	3	3	Nil	F
7	IT22251	Computer Programming and Practice (Common to AE, AM, BT, CE, CH)	ES	2	0	2	3	4	Nil	F
8	AE22101	Computer Aided Engineering Drawing (Common to AE, AM)	ES	3	0	2	4	5	Nil	F
PRACTICAL										
9	CY22161	Chemistry Laboratory (Common to all Branches except AD, CS, IT)	BS	0	0	2	1	2	Nil	F
10	ME22162	Basic Mechanical Engineering Laboratory (Common to AE, AM, BT, CH)	ES	0	0	2	1	2	Nil	F
			Total	18	1	8	23	27		

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK				Total Periods	Prerequisite	Position
				L	T	P	C			
THEORY										
1	HS22251	Science and Technology in Ancient Tamil Society (Common to all Branches)	HS	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	MA22151	F
4	PH22253	Engineering Materials (Common to AE, AM, 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	IT22252	Computer Applications and Python Programming (Common to AM, MR)	ES	2	0	2	3	4	Nil	F
7	AE22201	Production Processes (Common to AE, AM)	PC	3	0	0	3	3	Nil	F
PRACTICAL										
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
			Total	**19**	**1**	**6**	**23**	**26**		

HS22151   தமிழ் மொழியும் தமிழர் மரபும்   **L T P C**
     Tamil Language and Heritage of Ancient Tamil Society   **1 0 0 1**
     (Common to all Branches)

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 தொழில்நுட்ப கல்விக்கும் 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
HS22152	**COMMUNICATIVE ENGLISH** (Common to all Branches)	**3**	**0**	**0**	**3**

HS22152 COMMUNICATIVE ENGLISH
(Common to all Branches)

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 listeningskills.
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 draftingcorrespondences 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 developingtelephone 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 taglinesfrom 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 otherbasic 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.

Listening - video lectures, video demonstration of a concept; **Speaking** - presentingpapers/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:		
CO1	Acquire adequate vocabulary for effective communication.	**3**
CO2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	**3**
CO3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	**4**
CO4	Comprehend conversations and short talks delivered in English.	**6**
CO5	Write short write-ups and personal letters and emails in English.	**6**

REFERENCES:

1. Department of English, Anna University, "Mindscapes: English for Technologistsand 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", CambridgeUniversity 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

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

MA22151	**APPLIED MATHEMATICS I**	**L**	**T**	**P**	**C**
	(Common to all Branches except MR)	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

The student should be made to:
1. Compute Eigen values and Eigen vectors and use in diagonalization and in classifying real quadratic forms.
2. Study differential calculus and its applications to relevant Engineering problems.
3. Compute derivatives using the chain rule or total differentials.
4. Understand the rotation of two-dimensional geometry using definite integrals.
5. Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I   MATRICES   **(9+3)**

Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values and Eigen vectors - Statement and Applications of Cayley-Hamilton Theorem - Diagonalization of matrices - Reduction of a quadratic form into canonical form by orthogonal transformation - Nature of quadratic forms.

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

Curvature and radius of Curvature - Centre curvature - Circle of curvature - Evolutes - Envelopes - Evolute as Envelope of Normals.

UNIT III   DIFFERENTIAL CALCULUS FOR SEVERAL VARIABLES   **(9+3)**

Limits and Continuity - Partial derivatives - Total derivatives - Differentiation of implicit functions - Jacobians and properties - Taylor's series for functions of two variables - Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers.

UNIT IV   APPLICATION OF DEFINITE INTEGRALS   **(9+3)**

Integration by Parts - Bernoulli's formula for integration - Definite integrals and its Properties - Solids of Revolution - Disk Method - Washer Method - Rotation about both x and y axis and Shell method.

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

Double integrals in Cartesian and polar coordinates - Change of order of integration - Area enclosed by plane curves - Change of variables in double integrals - Triple integrals - Volume of solids.

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

OUTCOMES:

Course Outcomes	**RBT LEVEL**
Upon successful completion of the course, the students should be able to:	
CO1 Solve the Eigen value problems in matrices.	**3**
CO2 Apply the basic notion of calculus in Engineering problems and to tackle for different geometries.	**3**
CO3 Perform calculus for more than one variable and its applications in Engineering problems.	**3**
CO4 Apply definite integrals for design of three-dimensional components.	**3**
CO5 Evaluate multiple integral in Cartesian and polar coordinates.	**3**

TEXTBOOKS:

1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, 2015.
2. Grewal. B.S, Grewal. J.S., "Higher Engineering Mathematics", 43rd 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", 4th 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

PH22152	**ENGINEERING PHYSICS**	**L T P C**
	(Common to AE, AM, CE, ME, MN, MR)	**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_2 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 - 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 fault.

TOTAL: 45 PERIODS

OUTCOMES:

Course Outcomes	RBT LEVEL
Upon successful completion of the course, the students should be able to:	
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. 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", 7th Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010.

CY22152	ENGINEERING CHEMISTRY	L	T	P	C
	(Common to AE, AM, ME, MN)	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
Upon successful completion of the course, the students should 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. P.C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai & Sons, New Delhi, 17th 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. B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry", 47th edition, Vishal Publishing C., Jalandhar, 2018.
3. P.L. Sony and H.M. Chawla, "Text Book of Organic Chemistry", Sultan Chand and Sons Publishers, New Delhi, 2000.

IT22251	**COMPUTER PROGRAMMING AND PRACTICE**	**L T P C**
	(Common to AE, AM, BT, CE, CH)	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+P:30): 60 PERIODS

OUTCOMES:

	Course Outcomes	RBT LEVEL
At the end of the course, the student should be able to:		
CO1	Understand the model of a computer, software design methodologies, and represent solutions to computational problems as algorithms.	3
CO2	Analyze the problem scenarios and develop C programs using sequential, conditional, and iterative constructs .	4
CO3	Appraise problem scenarios and develop C programs using complex storage structures.	4
CO4	Design modularized solutions for larger problems.	3
CO5	Inspect the storage structure in a computer and design C programs to access permanent storage.	4

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

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

AE22101   **COMPUTER AIDED ENGINEERING DRAWING**   **L T P C**
                     (Common to AE, AM)   **3 0 2 4**

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)
Eigen values and Eigen vectors of a real matrix - Characteristic equation - Properties of Eigen values Construction and drafting of Engineering Curves: Cycloid, Involutes 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
	Upon successful completion of the course, the students should be able to:	
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. K.R. Gopalakrishna, Sudhir Gopalakrishna, "Textbook Of Computer Aided Engineering Drawing", Subhas Publications, 2017.

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

CY22161	**CHEMISTRY LABORATORY**	**L**	**T**	**P**	**C**
	(Common to all Branches except AD, CS, IT)	**0**	**0**	**2**	**1**

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 anddomestic use.
2. To gain the knowledge on electrochemical instrumentation techniques like potentialand 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 molecularweight.

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 EDTAMethod.
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 Paperchromatography.
10. Determination of molecular weight of polymer by using Ostwald's/Ubbelohdeviscometer.

TOTAL: 30 PERIODS

OUTCOMES:

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

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 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 198.

ME22162	**BASIC MECHANICAL ENGINEERINGLABORATORY**	**L**	**T**	**P**	**C**
	(Common to AE, AM, BT, CH)	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

1. To provide exposure and hands on experience to the students on various basicmechanical 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:

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

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

REFERENCES:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education, 7th edition,2009.
2. Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited,2007.
3. Ian Gibson, David W Rosen, Brent Stucker., "Additive ManufacturingTechnologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
4. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on EngineeringPractices Laboratory", Anuradha Publications, 2007.
5. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices LabManual", 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.

அறிவியல் மற்றும் தொழில்நுட்பத்தில் தமிழ் | L | T | P | C |
Science and Technology in Ancient Tamil Society

L T P C
2 0 0 2

(Common to all Branches)

பாடத்தின்நோக்கங்கள்:

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

அலகு I   அறிவியலில் தமிழ்   5

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   25

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 குமுழி 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), "கணினியும்தமிழ்கற்பித்தலும்", புலமைவெளியீடு, 38-Bமண்ணத்நதோட்டத்தெரு, ஆழ்வார்பேட், சென்னை 600018.

3. மு. பொன்னவைக்கோ, (2003), "வளர்தமிழில்அறிவியல்-இணையத்தமிழ்", அனைத்திந்தியஅறிவியல்தமிழ்க்கழகம், தஞ்சாவூர்615 005.

4. துரை. மணிகண்டன், (2008), "இணையமும்தமிழும்", நல்நிலம்பதிப்பகம், 7-3, சிமேட்லிசாலை, தியாகராயநகர், சென்னை 600 017.

HS22252　　　　　　　　　**TECHNICAL ENGLISH**　　　　　　**L T P C**
　　　　　　　　　　　　　　　(Common to all Branches)　　　　　　　　**2 1 0 3**

COURSE OBJECTIVES:
1.　To enable learners to define and understand technical communication and scientific writing.
2.　To expose learners to nuances of seminar presentation, group discussion, and public speaking.
3.　To expose learners to writing for scientific purposes.
4.　To expose learners to drafting correspondences for business purposes.
5.　To expose learners to writing for documenting purposes.
6.　To enable students to have a holistic understanding 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

Suggested Activities [task based] - case study, guest lectures as models, problem solving, understanding teamwork.

OUTCOMES:

Course Outcomes		RBT LEVEL
At the end of the course, learners will 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. 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.

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

Software
1. Face2Face 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

MA22251	APPLIED MATHEMATICS II	**L T P C**
	(Common to all Branchesexcept MR)	**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, $1/Z$, $Z2$ - 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", 10th Edition, John Wiley, 2015.
2. Grewal. B.S, Grewal. J.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2015.

REFERENCES:
1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2013.
3. Bali. N.P., and Manish Goyal, "A Textbook of Engineering Mathematics", Ninth Edition, Laxmi Publications Pvt. Ltd., 2014.

Web Link:
1. https://nptel.ac.in/courses/111/105/111105134/
2. https://nptel.ac.in/courses/111/105/111105121/

PH22253	**ENGINEERING MATERIALS**	**L T P C**
	(Common to AE, AM, ME, MN)	**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-FERRROUS 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, Baintic 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) - Claussius-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 Tc and High Tc (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**
	Upon completion of the course, 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. Rajendran. V, "Engineering Physics", Tata McGraw Hill, 2015.
3. Suresh. R and Jayakumar. V, "Materials Science", Lakshmi Publications, 2003.
4. Raghavan. V, "Materials Science and Engineering - A first course", Sixth Edition, PHI publications, 2015.

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

EE22151   BASIC ELECTRICAL AND ELECTRONICS ENGINEERING   L T P C
(Common to all Branches except CH, EE, EC)   3 0 0 3

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

UNIT I   ELECTRICAL CIRCUITS & MEASURMENTS   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   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.

UNIT III   ELECTRICALMACHINES   9
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single phase induction Motor, Single Phase Transformer.

UNIT IV   SEMICONDUCTORDEVICESANDAPPLICATIONS   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 V   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.

TOTAL: 45 PERIODS

OUTCOMES:

	Course Outcomes	RBT LEVEL
Upon completion of the course, students will be able to:		
CO1	Compute the electric circuit parameters for simple problems.	4
CO2	Understand the construction and characteristics of different electrical machines.	4
CO3	Describe the fundamental behavior of different semiconductor devices and circuits.	4
CO4	Design basic digital circuits using Logic Gates and Flip-Flops.	4
CO5	Analyze the operating principle and working of measuring instruments.	4

TEXTBOOKS:
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.
3. Mehta VK, "Principles of Electronics", S. Chand & Company Ltd, 2010.

REFERENCES:
1. Muthu Subramanian 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.

IT22252   COMPUTER APPLICATIONS AND PYTHON PROGRAMMING   L T P C
(Common to AM, MR)   **3 0 0 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   9
Characteristics of a computer - Classification of Computers – Computer Organization and Architecture–CentralProcessing Unit – Communication among various units – Data Representation – Number System- Computer Memoryand Storage: Memory Hierarchy – Primary and Secondary Storage – Importance of Input and Output Hardware–Computer Terminals.

UNIT II   NETWORKS AND INTERNET   9
Data Communication – Transmission Media - The Benefits of Networks - Types of Networks – NetworkTopologies - Client/Server & Peer-to-Peer – VPNs - Wired and Wireless Networks - Basic Internet Terms–Internet Applications - Narrowband, Broadband, & Access Providers - Internet Tools: Webbrowsers–E-mail - Search Engines.

UNIT III   COMPUTER SECURITY AND EMINENT TECHNOLOGIES   9
Computer Security: Introduction to Computer Security – Security Threats – Cryptographyandtypes–Firewall and Types of Firewall. Eminent Technologies: Mobile communications, Blue tooth, GlobalPositioning system, Electronic Data Interchange.

UNIT IV   DATA, EXPRESSIONS, STATEMENTS   9
Python interpreter and interactive mode; values and types: int, float, boolean, string, andlist; variables,expressions, statements, precedence of operators, comments; function definition and use, flowof execution,parameters and arguments – Local and Global Scope; Conditional Statements – Iterative StatementsSuggested Activities.

UNIT V   STRING, LISTS, TUPLES, DICTIONARIES   9
Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Lists:listoperations, list slices, list methods, mutability, aliasing, cloning lists, list parameters; Tuples: tupleassignment, tuple as return value; Dictionaries: operations and methods.

                                                            TOTAL: 45 PERIODS
OUTCOMES:

Course Outcomes		RBT LEVEL
Upon completion of the course, students will be able to:		
CO1	Understand the characteristics and data processing methodologies of a computer.	2
CO2	Differentiate various networks and their underlying terminologies.	3
CO3	Understand the recent advancements in computers.	2
CO4	Develop algorithmic solutions to simple computational problems by decomposing into multiple functions.	4
CO5	Represent compound data using Python lists, tuples, dictionaries for solving problems.	4

TEXTBOOKS:

1. 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/).
2. Introduction to Information Technology, ITL Education Solution Ltd. 2nd edition 2012 Pearson Education.

REFERENCES:

1. Brian K Williams, Stacey C Sawer "Using Information Technology – A practical introductiontocomputers and communications", 11th edition 2015 ,Mc Graw H ill (P) Ltd.,
2. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: AnInter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Turban, Rainer, Potter, "Introduction to Information Technology", second edition, Wiley Publications.
5. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.

AE22201   **PRODUCTION PROCESSES**   **L T P C**
                    (Common to AE, AM)   **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_2 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
	Upon completion of the course, 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

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

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", 21st Edition, Khanna Publishers, 2005.
2. Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing", 8th Edition, Prentice-Hall of India, 1997.
3. Rao, P.N. "Manufacturing Technology: Foundry, Forming and Welding", 4th 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.

PH22161   **PHYSICS LABORATORY**   **L T P C**
<div align="center">(Common to all Branches except BT)   0 0 2 1</div>

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.

<div align="right">TOTAL: 30 PERIODS</div>

OUTCOMES:

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

REFERENCES:
1. Physics Laboratory practical manual, 1ˢᵗ Revised Edition by Faculty members, 2018.

EE22111   **BASIC ELECTRICAL AND ELECTRONICS**   **L T P C**
                       ENGINEERING LABORATORY   **0 0 2 1**
                       (Common to all Branches except EC)

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:

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