NPR
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Approved by AICTE,New Delhi & Affiliated to Anna University,Chennai| Accredited by NAAC with 'A' GRADE
Recognized by UGC under 2 (f) | ISO 9001:2015 Certified | Web: www.nprcolleges.org | E-Mail: nprcetprincipal@nprcolleges.org
NPR Nagar, Natham - 624 401, Dindigul Dist, Tamil Nadu. Ph: 04544 - 246500, 501, 502.

Science and Humanities

REGULATION - 2023

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABUS

Chairperson – Board of Studies
Department of Science & Humanities

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DEPARTMENT OF SCIENCE & HUMANITIES

VISION

- Preparing students to attain excellence in education.

MISSION

- To build self-confidence by improving their logical thinking, systematic learning, communication skills and human resource capacity building in Science.
- To explore the latest technology in the field of Science and Humanities.
- To inculcate motivation and positive thinking among the students by bringing out their latent abilities.

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PROGRAM OUTCOMES

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 analyze 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 modeling 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.

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Department of Science & Humanities

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 ones 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.

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Department of Science & Humanities

SEMESTER I									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	Departments
				L	T	P			
1.	23IP100	Induction Programme	-	-	-	-	-	0	Common to all
THEORY									
2.	23HS101	Professional English - I	HSMC	3	0	0	3	3	Common to all
3.	23MA101	Matrices and Calculus	BSC	3	1	0	4	4	Common to all
4.	23PH101	Engineering Physics	BSC	3	0	0	3	3	Common for B.E/B.Tech., Civil, Mech, EEE, CSE, IT and AI & DS
	23PH102	Physics for Electronics Engineering	BSC						B.E. ECE
5.	23CY101	Engineering Chemistry	BSC	3	0	0	3	3	Common to all
6.	23GE101	Problem Solving and C Programming*	ESC	3	0	2	5	4	Common for B.E/B.Tech., EEE, CSE, ECE and IT
	23GE102	Problem Solving and Python Programming*							Common for B.E/B.Tech., Civil, Mech and AI & DS
7.	23GE103	தமிழர்மரபு /HERITAGE OF TAMILS**	HSMC	1	0	0	1	1	Common to all
PRACTICALS									
8.	23BS111	Physics and Chemistry Laboratory	BSC	0	0	4	4	2	Common for B.E/B.Tech., Civil, Mech, EEE, CSE, IT and AI & DS
	23BS112	Physics and Chemistry Laboratory for Electronics Engineering	BSC						B.E. ECE
9.	23GE112	English Laboratory - I	EEC	0	0	2	2	1	Common to all

* - Approved by respective BoS

** - Syllabus of Anna University R-2021 is to be followed of GE3152 தமிழர்மரபு /HERITAGE OF TAMILS

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Department of Science & Humanities

23IP100 **INDUCTION PROGRAMME**

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) **Physical Activity**

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) **Creative Arts**

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Chairperson – Board of Studies
Department of Science & Humanities

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References: Guide to Induction program from AICTE

Chairperson – Board of Studies
Department of Science & Humanities

I SEMESTER

I - Course Name: 23HS101 PROFESSIONAL ENGLISH - I

Program Name	B.E./B.TECH. – COMMON TO ALL BRANCHES	Sem	Category	L	T	P	C
Prerequisites	NIL	I	HSMC	3	0	0	3

II - Course Objectives

1.	To improve the communicative competence of learners.	
2.	To learn to use basic grammatic structures in suitable contexts.	
3.	To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.	
4.	To help learners use language effectively in professional contexts.	
5.	To develop learners' ability to read and write complex texts, summaries, articles, blogs,definitions, essays and user manuals.	

III - Course Content

Preamble:
This course is designed to impart required levels of Communication Skills in Reading and Writing and Proficiency in English language in writing necessary for different professional contexts.

Unit – I	INTRODUCTION TO EFFECTIVE COMMUNICATION	9 Hours

Fundamentals of Communication- effective communication- seven C's of effective communication **Reading** - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. **Writing** - Writing emails / letters. **Grammar** – Simple Tenses (Present / Past /Future); Question types: Wh/ Yes or No/- Question Tags. **Vocabulary** – Synonyms (word -meaning- sentence making); (One word substitution; Abbreviations & Acronyms (as used in technical contexts) –Silent letters

Unit – II	NARRATION AND SUMMATION	9 Hours

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. **Writing** - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) **Grammar** –Progressive tenses (Present / Past /Future); Subject-Verb Agreement; Prepositions. **Vocabulary** - Wordforms (prefixes& suffixes); Phrasal verbs.

Unit – III	DESCRIPTION OF A PROCESS / PRODUCT	9 Hours

Reading – Reading advertisements, gadget reviews; user manuals. **Writing** - Writing definitions; instructions; and Product /Process description. **Grammar** - Imperatives; Adjectives; Degrees of comparison; Perfect Tenses (Present / Past /Future); **Vocabulary** - Compound Nouns, Homonyms; and Homophones.

Unit – IV	CLASSIFICATION AND RECOMMENDATIONS	9 Hours

Reading – Newspaper articles; Journal reports –and Non-Verbal Communication (tables, pie charts etc,) Note-making. **Writing** –Writing recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode), Transcoding, **Grammar** – Perfect continuous tenses (Present /

Chairperson – Board of Studies
Department of Science & Humanities

Past /Future); Articles; Pronouns - Possessive & Relative pronouns. **Vocabulary** - Collocations; Fixed / Semi fixed expressions – Idioms and Phrases		
Unit – V	**EXPRESSION**	**9 Hours**
Reading – Reading editorials; and Opinion Blogs; **Writing** – Essay Writing (Descriptive or narrative). **Grammar**– Punctuation; Simple, Compound & Complex Sentences. **Vocabulary** - Cause & Effect Expressions – Content vs Function words – British & American vocabulary (spelling and word changes)		

Text Books:	[1] English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2023 edition)
	[2] English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.
Reference Books:	[1] Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.
	[2] A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India)Pvt. Ltd.
	[3] English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw HillEducation, ISBN : 0070264244.
	[4] Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
	[5] Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.
MOOC/Web Platforms:	https://onlinecourses.nptel.ac.in/noc23_hs115/preview

IV - Course Outcome

	On completion of the course, the students will be able to	Bloom's Level Mapped
CO1	To use appropriate words in a professional context and communicate in a professional context.	Apply (BL 3)
CO2	To gain understanding of basic grammatic structures and use them in right context.	Understand (BL 2)
CO3	To read and infer the denotative and connotative meanings of technical texts and use technical words in describing products with appropriate definitions.	Apply (BL 3)
CO4	To write definitions, descriptions, narrations and essays on various topics.	Create (BL 6)
CO5	To express their opinions effectively in both oral and written medium of communication.	Create (BL 6)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

Chairperson – Board of Studies
Department of Science & Humanities

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-2	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-3	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-4	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-5	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson - Board of Studies
Department of Science & Humanities

I - Course Name: 23MA101 MATRICES AND CALCULUS

Program Name	B.E./B.TECH. COMMON TO ALL BRANCHES	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	3	1	0	4

II - Course Objectives

1.	To develop the use of matrix algebra techniques that is needed by engineers for practical applications.	
2.	To familiarize the student with functions of several variables. This is needed in many branches of engineering.	
3.	To familiarize the students with integral calculus and various techniques of integration.	
4.	To make the students understand the concepts of vector calculus and applications.	
5.	To acquaint the student with mathematical tools needed in evaluating ordinary differential equations and their applications.	

III - Course Content

Preamble:
This course introduces basic concepts and techniques of multivariable calculus, matrices, and ordinary differential equations and highlights their applications in various field of engineering such as Design Engineering, Electric Circuit Theory, Cryptography, Resistor conversion, Robotics etc

Unit – I	MATRICES	12 Hours

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley – Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

Unit – II	FUNCTIONS OF SEVERAL VARIABLES	12 Hours

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

Unit – III	INTEGRAL CALCULUS AND MULTIPLE INTEGRALS	12 Hours

Definite integrals – Properties – Problems- Double and Triple integrals – Cartesian, polar coordinates – change of order of integration – Applications: Area between curves, Volume of integrals.

Unit – IV	VECTOR CALCULUS	12 Hours

Gradients - Divergence - Curl – Directional derivative - Irrotational and Solenoidal vector fields– Vector Integration (Line integral, Surface integral, Volume integral, Simple Problems only) – Green's theorem in plane, Gauss divergence theorem and Stoke's Theorem (excluding proof) – Simple applications involving cubes and rectangular parallelopipeds.

Unit – V	ORDINARY DIFFERENTIAL EQUATIONS	12 Hours

Higher order linear differential equations with constant coefficients – Method of variation of parameters. Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

Chairperson - Board of Studies
Department of Science & Humanities

Text Books:	[1] Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016. [2] Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018. [3] James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].
Reference Books:	[1] Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016. [2] Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009. [3] Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016. [4] Narayanan. S. and ManicavachagomPillai. T. K.,"Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009. [5] Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016. [6] Srimantha Pal and Bhunia. S.C, "Engineering Mathematics " Oxford University Press, 2015. [7] Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.
MOOC/Web Platforms:	https://nptel.ac.in/courses/122104018 https://archive.nptel.ac.in/courses/111/106/111106146/ https://onlinecourses.nptel.ac.in/noc21_ma16/preview https://digimat.in/nptel/courses/video/111105122/L01.html

IV - Course Outcome

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Use the matrix algebra methods for solving practical problems.	Apply (BL 3)
CO2	Able to use differential calculus ideas on several variable functions.	Apply (BL 3)
CO3	Apply integral calculus and multiple integral tools in solving various application problems.	Apply (BL 3)
CO4	Understand the concepts of Gradient, divergence and curl of a vector point function and related applications.	Understand (BL 2)
CO5	Apply various techniques in solving ordinary differential equations.	Apply (BL 3)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

Chairperson – Board of Studies
Department of Science & Humanities

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
CO-2	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
CO-3	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
CO-4	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
CO-5	3	3	-	-	-	-	-	-	2	-	-	2	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson - Board of Studies
Department of Science & Humanities

I - Course Name: 23PH101 ENGINEERING PHYSICS

Program Name	B.E./B.TECH. COMMON FOR CIVIL, CSE, EEE, MECH, IT AND AI&DS	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	3	0	0	3

II - Course Objectives

1.	To instill the essentials of properties of matter.	
2.	To gain knowledge of electromagnetic waves and its applications.	
3.	To amplify the information on optical fiber for communication purposes.	
4.	To describe the principles of quantum mechanics and their various applications.	
5.	To provide the fundamental understanding of crystals and their numerous crystal formations.	

III - Course Content

Preamble:
The aim of the Engineering Physics course is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.

Unit – I	PROPERTIES OF MATTER	9 Hours

Elasticity – stress - strain - Hooke 's law- S-S diagram - factors affecting elastic modulus and tensile strength – Torsion pendulum - moment of inertia of a body - young's modulus – cantilever method, uniform and non-uniform bending – I-shaped girders - Poisson's ratio.

Unit – II	ELECTROMAGNETIC FIELD AND WAVES	9 Hours

The Maxwell's equations - wave equation; plane electromagnetic waves in vacuum, conditions on the wave field - properties of electromagnetic waves - energy and momentum in EM waves: intensity, waves from localized sources, momentum and radiation pressure – smart phone reception.

Unit – III	LASER AND FIBER OPTICS	9 Hours

LASER- interaction of light radiation with materials - Einstein's coefficients - Nd:YAG, CO_2, quantum dot laser – LIDAR.
Fiber optics: modes of propagation of light – numerical aperture and acceptance angle - fiber optical communication system - fiber optic displacement sensors.

Unit – IV	QUANTUM PHYSICS	9 Hours

Comparison between classical and quantum theory – Compton scattering:experimental description-uncertainty principle – physical significance of wave function - Schrödinger's wave equation – time dependent and time independent equations – particle in a box - quantum confinement.

Unit – V	CRYSTAL PHYSICS	9 Hours

Crystallography – unit cell, primitive cell - crystal systems, Bravais lattices, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP structures-diamond & NaCl Crystal structure - crystal defect and dislocation. crystal growth techniques: Bridgman method.

Chairperson – Board of Studies
Department of Science & Humanities

Books for study & Reference:	[1] Tipler Mosca, Physics For Scientists and Engineers 6th Edition, 2015 [2] Gaur R.K. and Gupta S.L, Engineering Physics, Dhanpat Rai Publications, 2013. [3] Bhattacharya D.K. & Poonam T., Engineering Physics, Oxford University Press, 2015. [4] S. O. Pillai, Solid State Physics, New Age International Private Limited, 10th edition,2022 Marikani A, Engineering Physics, PHI, New Delhi, 2013.
MOOC/Web Platforms:	https://onlinecourses.nptel.ac.in/noc20_mm13/preview https://www.noaa.gov/jetstream/satellites/electromagnetic-waves https://fractory.com/fibre-lasers-explained/ https://www.livescience.com/33816-quantum-mechanics-explanation.html https://archive.nptel.ac.in/courses/115/104/115104109/

IV - Course Outcome

On completion of the course, the students will be able to		**Bloom's Level Mapped**
CO1	Choose the correct materials based on their qualities for any intended applications and learn the basics of elasticity and its engineering-related applications.	Apply, (BL 3)
CO2	Express their knowledge in electromagnetic waves.	Understand (BL 2)
CO3	Infer the characteristics of laser for various Engineering applications and expand the understanding of optical fibers use in communications.	Understand (BL 2)
CO4	Apply quantum theory's sophisticated physics notions to the matter characterization.	Apply (BL 3)
CO5	Know the fundamentals of crystal formations and growth methods.	Understand (BL 2)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ Pos	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
CO-1	3	2	3	3	-	-	2	-	-	-	-	3	-	-	-
CO-2	3	2	3	2	-	-	2	-	-	-	-	3	-	-	-
CO-3	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-
CO-4	3	3	3	2	-	-	3	-	-	-	-	2	-	-	-
CO-5	3	2	3	3	-	-	-	-	-	-	-	1	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson – Board of Studies
Department of Science & Humanities

I - Course Name: 23PH102 PHYSICS FOR ELECTRONICS ENGINEERING

Program Name	B.E. ELECTRONICS AND COMMUNICATION ENGINEERING	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	3	0	0	3

II - Course Objectives

1.	To instill the essentials of properties of matter.	
2.	To describe the principles of quantum mechanics and their various applications.	
3.	To provide the fundamental understanding of crystals and their numerous crystal formations.	
4.	To recognize the modelling of conducting materials' transport properties using both classical and quantum theories.	
5.	To become knowledgeable about semiconductors and understands the applications of magnetic materials.	

III - Course Content

Preamble:
The aim of the Physics for electronics engineering course is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in electronics engineering disciplines. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programme.

Unit – I	PROPERTIES OF MATTER	9 Hours

Elasticity – stress - strain - Hooke 's law- S-S diagram - factors affecting elastic modulus and tensile strength – Torsion pendulum - moment of inertia of a body - young's modulus – cantilever method, uniform and non-uniform bending – I-shaped girders - Poisson's ratio.

Unit – II	QUANTUM PHYSICS	9 Hours

Comparison between classical and quantum theory – Compton scattering:experimental description-uncertainty principle – physical significance of wave function - Schrödinger's wave equation – time dependent and time independent equations – particle in a box - quantum confinement.

Unit – III	CRYSTAL PHYSICS	9 Hours

Crystallography – unit cell, primitive cell - crystal systems, Bravais lattices, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP structures-diamond & NaCl Crystal structure - crystal defect and dislocation. crystal growth techniques: Bridgman method.

Unit – IV	CONDUCTING MATERIALS	9 Hours

Classical free electron theory - electrical and thermal conductivity, expression - Wiedemann-Franz law - electrons in metals - particle in a three-dimensional box - degenerate states - Fermi-Dirac statistics - density of energy states - electron in periodic potential: Bloch theorem - metals and insulators - energy bands in solids - electron effective mass.

Unit – V	SEMICONDUCTING AND MAGNETIC MATERIALS	9 Hours

Direct and indirect band gap semiconductors- carrier concentration in intrinsic semiconductors- carrier concentration in n-type & p-type semiconductors- Hall effect and applications -

Chairperson – Board of Studies
Department of Science & Humanities

classification of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials - domain theory -hysteresis (based on domain theory) - soft and hard magnetic materials	
Books for study & Reference:	[1] Tipler Mosca, Physics For Scientists and Engineers 6th Edition, 2015 [2] Gaur R.K. and Gupta S.L, Engineering Physics, Dhanpat Rai Publications, 2013. [3] Bhattacharya D.K. & Poonam T., Engineering Physics, Oxford University Press, 2015. [4] S. O. Pillai, Solid State Physics, New Age International Private Limited, 10th edition,2022 Marikani A, Engineering Physics, PHI, New Delhi, 2013.
MOOC/Web Platforms:	https://onlinecourses.nptel.ac.in/noc20_mm13/preview https://www.livescience.com/33816-quantum-mechanics-explanation.html https://archive.nptel.ac.in/courses/115/104/115104109/ https://onlinecourses.nptel.ac.in/noc20_ph10/preview semiconductors-insulators/semiconductor-materials-types-groups.php

IV - Course Outcome

On completion of the course, the students will be able to		**Bloom's Level Mapped**
CO1	Choose the correct materials based on their qualities for any intended applications and learn the basics of elasticity and its engineering-related applications.	Apply (BL 3)
CO2	Apply quantum theory's sophisticated physics notions to the matter's characterization.	Apply (BL 3)
CO3	Know the fundamentals of crystal formations and growth methods.	Understand (BL 2)
CO4	To understand about the creation of energy band structures, free electro theory, and quantum theory.	Understand (BL 2)
CO5	To gain knowledge about semiconductor and magnetic materials, as well as the applications for them.	Understand (BL 2)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ Pos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	2	3	3	-	-	2	-	-	-	-	3	-	-	-
CO-2	3	3	3	2	-	-	3	-	-	-	-	2	-	-	-
CO-3	3	2	3	3	-	-	-	-	-	-	-	1	-	-	-
CO-4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-5	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

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Department of Science & Humanities

I - Course Name: 23CY101 ENGINEERING CHEMISTRY

Program Name	B.E./B.TECH. COMMON TO ALL BRANCHES	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	3	0	0	3

II - Course Objectives

1.	To inculcate sound understanding of water quality parameters and water treatment techniques.	
2.	To impart knowledge on the basic principles and preparatory methods of nanomaterials.	
3.	To introduce the basic concepts and applications of polymers and composites.	
4.	To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.	
5.	To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.	

III - Course Content

Preamble:

The objective of this course is to bestow the better understanding of basic concepts of chemistry and its applications in Engineering and Technology. This course provides exposure on properties of water and its treatment methods. It also imparts knowledge on properties and application of nano-materials in data storage devices. This course also highlights preparation, properties and applications of polymers and composite materials. It also imparts knowledge on fuel types and applications of energy conversion and storage devices.

Unit – I	WATER AND ITS TREATMENT	9 Hours

Water: sources and impurities, water quality parameters: colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: reverse osmosis. Boiler troubles: scale and sludge, boiler corrosion, caustic embrittlement, priming & foaming. Treatment of boiler feed water: internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and external treatment: ion exchange demineralisation and zeolite process.

Unit – II	NANO CHEMISTRY	9 Hours

Basics: distinction between molecules, nanomaterials and bulk materials; size-dependent properties (optical, electrical, mechanical and magnetic); types of nanomaterials: definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

Unit – III	POLYMERS AND COMPOSITES	9 Hours

Introduction: classification of polymers – natural and synthetic; thermoplastic and thermosetting. Functionality – preparation properties and uses of PVC, teflon, nylon 6,6 and epoxy resins. Composites: introduction: definition & need for composites; constitution: matrix materials

Chairperson – Board of Studies
Department of Science & Humanities

(Polymer matrix, metal matrix and ceramic matrix) and reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: metal matrix composites (MMC), ceramic matrix composites and polymer matrix composites. Hybrid composites - definition and examples.		
Unit – IV	**FUELS AND COMBUSTION**	**9 Hours**
Fuels: introduction, classification of fuels; coal and coke: analysis of coal (proximate and ultimate), carbonization, manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and diesel: manufacture of synthetic petrol (Bergius process), knocking - octane number, diesel oil - cetane number; power alcohol and biodiesel. Combustion of fuels: introduction: calorific value - higher and lower calorific values, theoretical calculation of calorific value; ignition temperature: spontaneous ignition temperature, explosive range; flue gas analysis - ORSAT Method. CO_2 emission and carbon foot print.		
Unit – V	**ENERGY STORAGE DEVICES**	**9 Hours**
Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: principle, working and applications of solar cells; recent developments in solar cell materials. Wind energy; geothermal energy; batteries: types of batteries, primary battery – dry cell, secondary battery -lead acid storage battery and lithium-ion-battery; electric vehicles-working principles; fuel cells: H_2-O_2 fuel cell, super capacitors		

Text Books:	P. C. Jain and Monica Jain, "Engineering Chemistry",Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 17th Edition, 2018. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 6th Edition 2012. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
Reference Books:	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2nd Edition,2017. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2nd Edition, 2019. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.,) Chennai, 4thEdition, 2021.
MOOC/Web Platforms:	https://nptel.ac.in/courses

Chairperson – Board of Studies
Department of Science & Humanities

IV - Course Outcome

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Summarize the water related problems in boilers and their treatment techniques.	Remember (BL 1)
CO2	Discuss the applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.	Understand (BL 2)
CO3	Discuss the types, properties and applications of polymers and composites.	Apply (BL 3)
CO4	Summarize the fuels used for engineering processes and applications of fuel	Understand (BL 2)
CO5	Summarize the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.	Apply (BL 3)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	-	-	-	3	-	-	-	-	2	-	-	-
CO-2	2	1	1	-	-	-	3	-	-	-	-	2	-	-	-
CO-3	2	1	1	-	-	-	3	-	-	-	-	2	-	-	-
CO-4	2	1	1	-	-	-	1	-	-	-	-	2	-	-	-
CO-5	3	2	2	-	-	-	3	-	-	-	-	3	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

Chairperson - Board of Studies
Department of Science & Humanities

23GE103 **HERITAGE OF TAMILS** **L T P C**

1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - ClassicalLiterature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the otherparts of India — Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: InternationalInstitute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)

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Department of Science & Humanities

23GE103 **தமிழர் மரபு** **LTPC**
1 0 0 1

அலகு I மொழி மற்றும் இலக்கியம்: 3
இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் – சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: 3
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

3

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:
தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் – தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் தமிழக வரலாறு – மக்களும் பண்பாடும் –
2. மற்றும் கல்வியியல் பணிகள் கழகம்).
3. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
4. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published

Chairperson – Board of Studies
Department of Science & Humanities

by: InternationalInstitute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – ReferenceBook.

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Department of Science & Humanities

I - Course Name: 23BS111 PHYSICS AND CHEMISTRY LABORATORY

Program Name	B.E./B.TECH. COMMON FOR CIVIL, CSE, EEE, MECH, IT AND AI&DS	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	0	0	4	2

II - Course Objectives

1.	To learn the correct usage of several types of physics lab equipment.	
2.	To learn, how to gather, present, and understand facts in a simple and succinct manner.	
3.	To learn Physics-related problem-solving abilities and experimental data interpretation.	
4.	To identify experimental measurement error and the methods used to reduce it	
5.	To encourage active participation from the learner in all aspects of the lab exercises.	

III - Course Content

Preamble:

This course aims to provide practical training in the estimation of physical parameters like band gap, ultrasound velocity, liquid compressibility, thin wire thickness, Young's modulus, and knowledge of the operation of the photoelectric effect, Michelson interferometer, laser, and fibre optics as well as to provide project-based skills development.

PHYSICS LABORATORY: (Any seven experiments to be conducted)

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc.
2. Uniform bending (or) Non-uniform Bending– Determination of young's modulus.
3. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
4. Laser- Determination of the wave length of the laser using grating.
5. (a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   (b) Compact disc- Determination of width of the groove using laser.
6. Air wedge – Determination of thickness of a thin sheet/wire.
7. Determination of Band gap of a semiconductor.
8. Particle size determination using LASER.
9. Simple harmonic oscillations of cantilever.
10. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

Chairperson – Board of Studies
Department of Science & Humanities

IV - Course Outcome (Physics Laboratory)

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Apprehend the concepts of interference, diffraction of light and recognize the resonance concept of waves.	Understand (BL 2)
CO2	Apply the principles of operations of optical fibers, semiconductor using simple circuits and interaction of electromagnetic waves and crystalline solids.	Apply (BL 3)
CO3	Measure the elastic moduli and moment of inertia of given materials with the help of suggested procedures.	Apply (BL 3)
CO4	Experiment the relationship between the light and matter & properties of liquids.	Analyze (BL 4)
CO5	Estimate the velocity of sound and compressibility of liquid.	Understand (BL 2)

II - Course Objectives (CHEMISTRY LABORATORY)

1.	To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.	
2.	To induce the students to familiarize with electroanalytical techniques such as, pH metry and potentiometry	
3.	To make the student to acquire practical skills conductometry in the determination of impurities in aqueous solutions.	
4.	To demonstrate the analysis of metals and alloys.	
5.	To demonstrate the synthesis of nanoparticles	

III - Course Content

Preamble:

This course aims to provide the students, a basic practical knowledge in chemistry. The objective of this course is to develop intellectual and psychomotor skills of the students by providing hands on experience in quantitative, electrochemical and photo-chemical analysis.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
11. Pseudo first order kinetics-ester hydrolysis.
12. Corrosion experiment-weight loss method.
13. Phase change in a solid.
14. Conductometric titration of strong acid vs strong base.

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Department of Science & Humanities

Reference Books:	Vogel'sTextbook ofQuantitative Chemical Analysis(8thedition,2014).
MOOC/Web Platforms:	-

IV - Course Outcome

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.	Analyze (BL 4)
CO2	Determine the amount of metal ions through volumetric and spectroscopic techniques.	Apply (BL 3)
CO3	Analyse and determine the composition of alloys.	Analyze (BL 4)
CO4	Learn simple method of synthesis of nanoparticles	Understand (BL 2)
CO5	Quantitatively analyse the impurities in solution by electroanalytica methods.	Analyze (BL 4)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	1	-	-	-	-	-	1	3	2	-	-	-	-	-
CO-2	3	1	-	-	-	-	-	1	2	1	-	-	-	-	-
CO-3	3	3	-	-	-	-	-	2	2	1	-	-	-	-	-
CO-4	3	2	-	-	-	-	-	1	3	2	-	-	-	-	-
CO-5	3	2	-	-	-	-	-	2	1	2	-	-	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

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Department of Science & Humanities

I - Course Name: 23BS112 PHYSICS AND CHEMISTRY LABORATORY FOR ELECTRONICS ENGINEERING

Program Name	B.E. ELECTRONICS AND COMMUNICATION ENGINEERING	Sem	Category	L	T	P	C
Prerequisites	NIL	I	BSC	0	0	4	2

II - Course Objectives

1.	To learn the correct usage of several types of physics lab equipment.	
2.	To learn, how to gather, present, and understand facts in a simple and succinct manner.	
3.	To learn Physics-related problem-solving abilities and experimental data interpretation.	
4.	To identify experimental measurement error and the methods used to reduce it	
5.	To encourage active participation from the learner in all aspects of the lab exercises.	

III - Course Content

Preamble:

This course aims to provide practical training in the estimation of physical parameters like band gap, ultrasound velocity, liquid compressibility, thin wire thickness, Young's modulus, and knowledge of the operation of the photoelectric effect and Michelson interferometer as well as to provide project-based skills development.

PHYSICS LABORATORY: (Any seven experiments to be conducted)

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc.
2. Uniform bending (or) Non-uniform Bending– Determination of young's modulus.
3. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
4. Air wedge – Determination of thickness of a thin sheet/wire.
5. Determination of Band gap of a semiconductor.
6. Simple harmonic oscillations of cantilever.
7. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
8. Photoelectric effect
9. Michelson Interferometer
10. Melde's string experiment
11. Experiment with lattice dynamics kit.

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Department of Science & Humanities

IV - Course Outcome (Physics Laboratory)

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Apprehend the concepts of interference, diffraction of light and recognize the resonance concept of waves.	Understand (BL 2)
CO2	Apply the principles of operations of semiconductor using simple circuits and interaction of electromagnetic waves and crystalline solids.	Apply (BL 3)
CO3	Measure the elastic moduli and moment of inertia of given materials with the help of suggested procedures.	Apply (BL 3)
CO4	Experiment the relationship between the light and matter & properties of liquids.	Analyse (BL 4)
CO5	Estimate the velocity of sound and compressibility of liquid.	Understand (BL 2)

II - Course Objectives (CHEMISTRY LABORATORY)

1.	To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.	
2.	To induce the students to familiarize with electroanalytical techniques such as, pH metry and potentiometry	
3.	To make the student to acquire practical skills conductometry in the determination of impurities in aqueous solutions.	
4.	To demonstrate the analysis of metals and alloys.	
5.	To demonstrate the synthesis of nanoparticles	

III - Course Content

Preamble:

This course aims to provide the students, a basic practical knowledge in chemistry. The objective of this course is to develop intellectual and psychomotor skills of the students by providing hands on experience in quantitative, electrochemical and photo-chemical analysis.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
11. Pseudo first order kinetics-ester hydrolysis.
12. Corrosion experiment-weight loss method.
13. Phase change in a solid.
14. Conductometric titration of strong acid vs strong base.

Chairperson – Board of Studies
Department of Science & Humanities

Reference Books:	Vogel'sTextbook ofQuantitative Chemical Analysis(8thedition,2014).
MOOC/Web Platforms:	-

IV - Course Outcome

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	Analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.	Analyse (BL 4)
CO2	Determine the amount of metal ions through volumetric and spectroscopic techniques.	Apply (BL 3)
CO3	Analyse and determine the composition of alloys.	Analyse (BL 4)
CO4	Learn simple method of synthesis of nanoparticles	Understand (BL 2)
CO5	Quantitatively analyse the impurities in solution by electroanalytica methods.	Analyse (BL 4)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	3	1	-	-	-	-	-	1	3	2	-	-	-	-	-
CO-2	3	1	-	-	-	-	-	1	2	1	-	-	-	-	-
CO-3	3	3	-	-	-	-	-	2	2	1	-	-	-	-	-
CO-4	3	2	-	-	-	-	-	1	3	2	-	-	-	-	-
CO-5	3	2	-	-	-	-	-	2	1	2	-	-	-	-	-

Mapping: 1-Low, 2-Medium, 3-High (Mapping value based on usage of Action verbs in each CO)

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Department of Science & Humanities

I - Course Name: 23GE112 ENGLISH LABORATORY -I

Program Name	B.E./B.TECH. COMMON TO ALL BRANCHES	Sem	Category	L	T	P	C
Prerequisites	NIL	I	EEC	0	0	2	1

II - Course Objectives

1.	To improve the communicative competence of learners	
2.	To help learners use language effectively in academic /work contexts	
3.	To develop various listening strategies to comprehend various types of audio materialslike lectures, discussions, videos etc.	
4.	To build on students' English language skills by engaging them in listening, speaking andgrammar learning activities that are relevant to authentic contexts.	
5.	To use language efficiently in expressing their opinions via various media.	

III - Course Content

Preamble:
This course is designed to equip students with the necessary skills to listen and speak so as to develop their linguistic and communicative competencies.

Unit – I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6 Hours

Listening for general information-specific details- conversation: Introduction to classmates - Audio /video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; -politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions (filling out a bank application for example).

Unit – II	NARRATION AND SUMMATION	6 Hours

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities- Note Taking. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations - describing experiences and feelings- engaging in small talk- describing requirements and abilities.

Unit – III	DESCRIPTION OF A PROCESS / PRODUCT	6 Hours

Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities (large & small)-talking about precautions.

Unit – IV	CLASSIFICATION AND RECOMMENDATIONS	6 Hours

Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.

Unit – V	EXPRESSION	6 Hours

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking – making predictions - talking about a given topic-giving opinions-understanding a website-describing processes.

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Department of Science & Humanities

Recommended Software:	[1] Globarena Software
	[2] Open-Source Software and YouTube Videos in Career Lab.
Manual	[1] English Laboratory Manual, Department of English, NPR College of Engineering & Technology College, Dindigul.
MOOC/Web Platforms:	https://www.digitalteacher.in/english-language-lab

IV - Course Outcome

On completion of the course, the students will be able to		Bloom's Level Mapped
CO1	To listen to and comprehend general as well as complex academic information.	Understand (BL 2)
CO2	To listen to and understand different points of view in a discussion.	Understand (BL 2)
CO3	To speak fluently and accurately in formal and informal communicative contexts.	Apply (BL 3)
CO4	To describe products and processes and explain their uses and purposes clearly and accurately.	Create (BL 6)
CO5	To express their opinions effectively in both formal and informal discussions.	Create (BL 6)

(Action verb of each CO to be matched with the next mapping table) (For example: if CO-1 uses the High Order Thinking Skills based action verb, then the corresponding PO must be mapped with High Correlation)

V - Mapping Table Mapping of COs with POs and PSOs

COs/ POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-2	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-3	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-4	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-
CO-5	-	-	-	-	-	-	-	-	3	3	-	2	-	-	-

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