

# **JERUSALEM COLLEGE OF ENGINEERING**

**(An Autonomous Institution)**

**Approved by AICTE & Affiliated to Anna University**

**Accredited by NAAC with 'A' Grade**

**Chennai – 600 100**



**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**B.E. BIOMEDICAL ENGINEERING**

# **CURRICULUM**

**REGULATION 2023**  
**CHOICE BASED CREDIT SYSTEM**



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**Velachery Main Road, Narayanapuram, Pallikaranai, Chennai – 600100**

## **DEPARTMENT OF BIOMEDICAL ENGINEERING**

### **VISION OF THE INSTITUTION**

Jerusalem College of Engineering is committed in emerging as an international institution of excellence in imparting finest quality engineering, technology and management education rooted in ethical and societal values through various academic programmes, multi-disciplinary research, consultancy and entrepreneurship activities and hence to contribute towards social transformation and nation building.

### **MISSION OF THE INSTITUTION**

- Generating abundant resources and making conducive policies, the management led by the Chairperson strives towards promoting globally competitive academic programmes augmented with value added courses, in-plant training activities, co-curricular activities and ambience that support intellectual growth and skill acquisition
- Promoting collaborative trans-border research programmes continuing education in synergy with academia, industries and research organizations leading to real time solutions and life-long learning
- Transforming young men and women into competent professionals and entrepreneurs motivated by a passion for professional excellence, driven by human values and proactively engage in the betterment of the society through innovative practices and academic excellence
- Facilitating effective interaction among faculty members and students and fostering network of alumni, industries, institutions and other stake-holders for successful career gain and placement

## **VISION OF THE DEPARTMENT**

Department of Biomedical Engineering is committed to produce Biomedical Engineers with ethical and social considerations and to foster their intellectual growth in multi-disciplinary fields for improving human condition and healthy nation building.

## **MISSION OF THE DEPARTMENT**

1. Providing technical knowledge through skilled innovative practices and experiments in ethical learning environment.
2. Creating new knowledge and enabling technologies in devising simple and low-cost methods for diagnosis and therapy at different medical fields through research and developmental activities.
3. Providing quality education and design activities in developing entrepreneurship qualities.

## PROGRAMME OUTCOMES (POs):

**The graduates will have the ability to**

**PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: 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.

**PO3: 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.

**PO 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.

**PO5: 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.

**PO6: 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.

**PO7: 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.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: 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.

**PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: 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.

## **PROGRAMME EDUCATIONAL OBJECTIVES**

**PEO 1:** To enable the graduates to develop prototype models and biomedical devices through the core foundation and knowledge acquired with multi-disciplinary approach.

**PEO 2:** To facilitate the graduates to adapt to the contemporary technologies and support healthcare providers at various levels with effective communication and team work.

**PEO 3:** To demonstrate the analytical skills to enhance and innovate with ethical commitment.

**PEO 4:** To empower the graduates to grow as pioneers in the healthcare sector.

## **PROGRAMME SPECIFIC OUTCOMES**

**The graduates will have the ability to**

**PSO1:** Development of innovative tools: an ability to design innovative tools to analyze and diagnose various pathological disorders.

**PSO2:** Medical Equipment maintenance and management: an ability to develop strategies to address the challenges of medical equipment maintenance and hospital management.

**CREDIT SUMMARY**

S.NO	CATEGORY	CREDITS AS PER SEMESTER								CREDIT TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1	HS	4	4	-	-	1	-	1	-	10
2	BS	10	9	3	3	-	-	-	-	25
3	ES	8	3	-	-	-	-	-	-	11
4	PC	-	5	16	12	16	12	2	10	73
5	PE	-	-	-	3	3	6	6	-	18
6	OE	-	-	-	3	3	3	3	-	12
7	EEC	-	2	-	3	2	3	3	-	13
<b>TOTAL</b>		<b>22</b>	<b>23</b>	<b>19</b>	<b>24</b>	<b>25</b>	<b>24</b>	<b>15</b>	<b>10</b>	<b>162</b>

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**CURRICULUM 2023 - (REGULATION 2023)**

**CHOICE BASED CREDIT SYSTEM**  
**I TO VIII SEMESTERS CURRICULUM AND SYLLABI**

**SEMESTER 1**

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JHS2121	English for Communicative Competence	I	HS	4	2	0	2	3
2	JMA2101	Matrices and Calculus	T	BS	4	2	2	0	3
3	JPH2101	Engineering Physics 1	T	BS	3	3	0	0	3
4	JCY2101	Engineering Chemistry	T	BS	3	3	0	0	3
5	JGE2101	Basic Engineering	T	ES	3	3	0	0	3
6	JCS2121	Programming in C	I	ES	5	3	0	2	4
7	JGE2102	Heritage of Tamils	T	HS	1	1	0	0	1
8	JPC2111	Engineering Physics and Chemistry Laboratory	P	BS	2	0	0	2	1
9	JGE2111	Basic Engineering Laboratory	P	ES	2	0	0	2	1
<b>TOTAL</b>					<b>27</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>22</b>

**SEMESTER 2**

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JHS2221	English for Science and Technology	I	HS	4	2	0	2	3
2	JMA2201	Statistics for Engineers	T	BS	4	2	2	0	3
3	JPH2201	Engineering Physics 2	T	BS	3	3	0	0	3
4	JGE2221	Engineering Graphics	I	ES	4	2	0	2	3
5	JEC2201	Electronic Devices and Circuit Analysis	T	PC	3	3	0	0	3
6	JCY2201	Environmental Science and Sustainability	T	BS	2	2	0	0	2
7	JGE2202	Tamils and Technology	T	HS	1	1	0	0	1
8	JPC2211	Engineering Physics and Environmental Science Laboratory	P	BS	2	0	0	2	1
9	JEC2211	Electronic Devices and Circuit Analysis Laboratory	P	PC	4	0	0	4	2
10	JGE2241	Gaming and Crafts Studio	P	EEC	4	0	0	4	2
<b>TOTAL</b>					<b>31</b>	<b>15</b>	<b>0</b>	<b>16</b>	<b>23</b>

### SEMESTER 3

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JMA2301	Transforms and Partial Differential Equations	T	BS	4	2	2	0	3
2	JBM2321	Biosciences	I	PC	5	3	0	2	4
3	JEC2321	Signals and Systems	I	PC	5	3	0	2	4
4	JBM2301	Human Anatomy and Physiology	T	PC	3	3	0	0	3
5	JBM2302	Sensors and Measurement	T	PC	3	3	0	0	3
6	JNC2361	Non-Credit Mandatory Course 1	T	NCM	3	3	0	0	-
7	JBM2311	Biomedical Data Analysis Laboratory	P	PC	4	0	0	4	2
8	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	*
<b>TOTAL</b>					<b>29</b>	<b>17</b>	<b>2</b>	<b>10</b>	<b>19</b>

*\* Only Internal Assessments will be conducted in the 3<sup>rd</sup> semester while the end semester examination will be conducted in the 4<sup>th</sup> semester.*

### SEMESTER 4

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JMA2401	Numerical Methods	T	BS	4	2	2	0	3
2	JBM2401	Biomaterials Engineering	T	PC	3	3	0	0	3
3	JBM2402	Biomedical Instrumentation	T	PC	3	3	0	0	3
4	JBM2421	Integrated Circuits	I	PC	5	3	0	2	4
5	-	Professional Elective 1	T	PE	3	3	0	0	3
6	-	Open Elective 1	T	OE	3	3	0	0	3
7	JBM2411	Biomedical Instrumentation Laboratory	P	PC	4	0	0	4	2
8	JGE2441	e-Protoshop	P	EEC	4	0	0	4	2
9	JPT2041	Soft Skills and Aptitude	P	EEC	2	0	0	2	1
<b>TOTAL</b>					<b>31</b>	<b>17</b>	<b>2</b>	<b>12</b>	<b>24</b>



### SEMESTER 5

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JBM2501	Diagnostic and Therapeutic Equipment	T	PC	3	3	0	0	3
2	JBM2521	Biomedical Signal Processing	I	PC	5	3	0	2	4
3	JBM2502	Medical Physics	T	PC	3	3	0	0	3
4	JEC2521	Microprocessors and Microcontrollers	I	PC	5	3	0	2	4
5	-	Professional Elective 2	T	PE	3	3	0	0	3
6	-	Open Elective 2	T	OE	3	3	0	0	3
7	JHS2541	Professional Communication	P	HS	2	0	0	2	1
8	JBM2511	Diagnostic and Therapeutic Equipment Laboratory	P	PC	4	0	0	4	2
9	JGE2541	Industry 4.0 Laboratory	P	EEC	4	0	0	4	2
10	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	*
<b>TOTAL</b>					<b>34</b>	<b>18</b>	<b>0</b>	<b>16</b>	<b>25</b>

*\* Only Internal Assessments will be conducted in the 5<sup>th</sup> semester while the end semester examination will be conducted in the 6<sup>th</sup> semester.*

### SEMESTER 6

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JBM2601	Artificial Intelligence and Pattern Recognition	T	PC	3	3	0	0	3
2	JBM2621	Medical Image Processing	I	PC	5	3	0	2	4
3	JBM2602	Radiological Equipment	T	PC	3	3	0	0	3
4	-	Professional Elective 3	T	PE	3	3	0	0	3
5	-	Professional Elective 4	T	PE	3	3	0	0	3
6	-	Open Elective 3	T	OE	3	3	0	0	3
7	JBM2611	Virtual Instrumentation Laboratory	P	PC	4	0	0	4	2
8	JGE2641	Product Development Laboratory	P	EEC	4	0	0	4	2
9	JPT2042	Technical Skills and Aptitude	P	EEC	2	0	0	2	1
<b>TOTAL</b>					<b>30</b>	<b>18</b>	<b>0</b>	<b>12</b>	<b>24</b>

### SEMESTER 7

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	-	Professional Elective 5	T	PE	3	3	0	0	3
2	-	Professional Elective 6	T	PE	3	3	0	0	3
3	-	Open Elective 4	T	OE	3	3	0	0	3
4	JNC2761	Non-Credit Mandatory Course 2	T	NCM	3	3	0	0	-
5	JHS2741	Entrepreneurship for Engineers	P	HS	2	0	0	2	1
6	JBM2741	Comprehension and Technical Seminar	P	EEC	2	0	0	2	1
7	JBM2742	Hospital Training	P	PC	4	0	0	4	2
8	JBM2743	Internship	P	EEC	-	-	-	4**	2
<b>TOTAL</b>					<b>20</b>	<b>12</b>	<b>0</b>	<b>8</b>	<b>15</b>

*\*\* Internship of 1 month must be undertaken in industry through semester 4,5 and 6 leading to 2 credits in semester 7*

### SEMESTER 8

S.no	Course Code	Course Title	T/P/I	Category	Contact Period	L	T	P	C
1	JBM2831	Project Work	P	PC	20	0	0	20	10
<b>TOTAL</b>					<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

Theory courses: 30

Integrated courses: 12

Practical courses: 22

**TOTAL CREDITS: 162**

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**LIST OF PROFESSIONAL ELECTIVES AS VERTICALS**

**(REGULATION – 2023)**

<b>VERTICAL I</b>	<b>VERTICAL II</b>	<b>VERTICAL III</b>	<b>VERTICAL IV</b>	<b>VERTICAL V</b>	<b>VERTICAL VI</b>
<b>HEALTHCARE MANAGEMENT</b>	<b>SIGNAL &amp; IMAGE PROCESSING</b>	<b>DESIGN OF MEDICAL DEVICES</b>	<b>BIO-ENGINEERING</b>	<b>COMMUNICATION SYSTEMS</b>	<b>REHABILITATION ENGINEERING</b>
JBM1029 Hospital Planning and Management	JBM1034 Radiographic Imaging Systems	JBM1038 Biomedical Entrepreneurship	JBM1002 Bio Transport Phenomena	JBM1016 Principles of Communication for Biomedical Engineers	JBM1004 Biomechanics
JBM1030 Computers in Medicine	JBM1021 Medical Imaging Techniques	JBM1039 Medical Device Design	JBM1043 Bioprinting	JBM1011 Telehealth Technology	JBM1007 Biofluids and Dynamics
JBM1031 Healthcare Technology	JBM1035 Biomedical Ultrasonics	JBM1040 Critical Care Equipment	JBM1001 BioMEMS	JBM1025 Body Area Network and Healthcare	JBM1012 Physiological Modelling
JBM1032 Quality Control for Medical Devices	JBM1036 Biometric Systems	JBM1006 Medical Optics	JBM1009 Nanotechnology and Applications	JBM1019 Neural Engineering	JBM1026 Rehabilitation Engineering
JBM1015 Medical Informatics	JBM1005 Virtual Instrumentation for Biomedical Engineers	JBM1024 Human Assist Devices	JBM1044 Medical Implants	JBM1027 Cognitive Neuroscience	JBM1020 Ergonomics
JBM1033 Medical Ethics	JBM1037 Soft Computing Techniques	JBM1041 Medical Device Standards, Regulation & Ethics	JBM1045 Artificial Organs	JBM1018 Robotics in Medicine	JBM1048 Neuromechanics of Human Movement
JBM1014 Healthcare Informatics	JBM1023 Brain Computer Interface Techniques	JBM1042 Clinical Research Methodology	JBM1046 Next gen Sequencing Technology	JBM1047 Virtual Reality in Medicine	JBM1049 Medical Haptics

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**OPEN ELECTIVES LIST**

**(REGULATION - 2023)**

S.no	Course Code	Course Title	Category	Contact Period	L	T	P	C
<b>IV Semester</b>								
1		Biomaterial Sciences	OE	3	3	0	0	3
2		Medical Instrumentation	OE	3	3	0	0	3
3		Biosensors	OE	3	3	0	0	3
<b>V Semester</b>								
4		Introduction to Biometrics	OE	3	3	0	0	3
5		Medical Waste Management	OE	3	3	0	0	3
6		IoT in Healthcare	OE	3	3	0	0	3
<b>VI Semester</b>								
7		Nanomedicine	OE	3	3	0	0	3
8		Image Processing	OE	3	3	0	0	3
9		Artificial Intelligence in Healthcare	OE	3	3	0	0	3
<b>VII Semester</b>								
10		Assistive Technology	OE	3	3	0	0	3
11		Bioinformatics	OE	3	3	0	0	3
12		Essentials of Telemedicine	OE	3	3	0	0	3

<b>JHS2121</b>	<b>ENGLISH FOR COMMUNICATIVE COMPETENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

**Course Objectives:**

- To enable the students of Engineering to develop their reading and other language skills
- To facilitate the learners to reflect and share their ideas effortlessly
- To develop their skills to communicate thoughts effectively in social contexts
- To expose them to different genres to develop their understanding and expression
- To train the students to improve their writing skills for efficient communication

**UNIT I Analytical Grammar and Information Sharing** **12**

Parts of speech – Functional units – Tenses – Affixes; Reading comprehension: short general passages for skimming and scanning

**Language Practice**

**Reading:** Biographical essays, short stories; **Speaking:** Self-introduction, peer introduction; **Listening:** Inspiring speeches, newscasts; **Writing:** Journal writing

**UNIT II Foundational Grammar and Expressing Thoughts** **12**

Framing questions – Prepositions – Compound nouns – Contextual meaning; Letter writing (informal letters)

**Language Practice**

**Reading:** Travelogues; **Speaking:** Small talks, Just A Minute (JAM); **Listening:** Anecdotes, stories, podcasts; **Writing:** Fill in the blanks in short dialogues

**UNIT III Functional Grammar and Social Communication** **12**

Articles – Subject-verb agreement – Synonyms and antonyms – Email etiquette; Dialogue writing

**Language Practice**

**Reading:** Adverts; **Speaking:** Role play, storytelling / completion; **Listening:** Messages from social network; **Writing:** Writing messages for social network / emails

**UNIT IV Structural Grammar and Visual Communication** **12**

Modal verbs – Simple, complex and compound sentences – Discourse markers – Correction of errors; Interpretation of posters on social issues

**Language Practice**

**Reading:** Excerpts from literature; **Speaking:** Asking for / giving directions - Picture description; **Listening:** Talks on English and language skills; **Writing:** Reporting on events / incidents

**UNIT V - Transformational Grammar and Written Communication** **12**

Degrees of comparison – Reported speech – Connotations – One-word substitutes (general); Essay writing: narrative / descriptive / expository / argumentative

**Language Practice**

**Reading:** Newspaper articles, social media messages (educational contexts); **Speaking:** Group discussions (general topics); **Listening:** Formal and informal talks, Ted talks; **Writing:** Writing short stories / poems (guided)

**TOTAL: 60 PERIODS**

## Course Outcomes:

### At the end of the course, students will be able:

- To comprehend reading passages and express themselves
- To communicate their thoughts confidently and skillfully
- To participate in activities of daily life using appropriate communicative strategies
- To be creative and critical in expressing themselves
- To write effectively and persuasively and produce different types of writing

### Text Books:

1. Department of English, Anna University, English for Engineers & Technologists, Volume 2, Orient BlackSwan Private Limited, Chennai, 2022.
2. Dhanavel, SP. English and Communication Skills for Students of Science and Engineering. Orient BlackSwan Private Limited, Chennai, 2011.
3. Interact English: Lab Manual for Undergraduate Students. Orient BlackSwan Private Limited, Chennai, 2017.

### Reference Books:

1. Chellammal, V. Learning to Communicate. Allied Publishing House, New Delhi, 2004.
2. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practices. Oxford University Press, New Delhi. 2015.
3. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2008.
4. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

### Web Links:

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishgrammar.org](http://www.englishgrammar.org)
3. [www.englishclub.com](http://www.englishclub.com)
4. [www.usingenglish.com](http://www.usingenglish.com)
5. [www.esl.about.com](http://www.esl.about.com)
6. [www.bbc.co.uk/learningenglish/](http://www.bbc.co.uk/learningenglish/)
7. <https://esl-bits.net/>
8. <https://elt.oup.com/>
9. <https://learnenglish.britishcouncil.org>
10. <https://quizizz.com/>

### Mapping of PO with CO

	1	2	3	4	5	6	7	8	9	10	11	12
CO-1	-	-	-	1	-	1	-	1	1	3	-	1
CO-2	-	-	-	1	-	1	-	1	1	3	-	1
CO-3	-	-	-	1	-	1	-	1	1	3	-	1
CO-4	-	-	-	1	-	1	-	1	1	3	-	1
CO-5	-	-	-	1	-	1	-	1	1	3	-	1

<b>JMA2101</b>	<b>MATRICES AND CALCULUS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>2</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students understand the concepts of multivariable calculus.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To familiarize students in the concepts of vector calculus and its applications.
- To help students understand theory of analytic functions and provide knowledge of Cauchy Residue theorem and its applications.

**UNIT I MATRICES**

**12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Reduction of a quadratic form to canonical form – Nature of quadratic forms.

**UNIT II FUNCTIONS OF SEVERAL VARIABLES**

**12**

Jacobians – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

**UNIT III APPLICATIONS OF INTEGRAL CALCULUS**

**12**

Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by plane curves – Triple integrals – Volume of solids.

**UNIT IV VECTOR CALCULUS**

**12**

Gradient and directional derivative – Divergence and curl – Irrotational and Solenoidal vector fields.  
Green’s theorem, Gauss’ divergence theorem, Stoke’s theorem – Verification and evaluation in simple problems.

**UNIT V COMPLEX ANALYSIS**

**12**

Analytic functions – Cauchy-Riemann equations – Milne-Thomson rule (given real or imaginary part) – Bilinear transformation.  
Residues – Application of Cauchy’s Residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only).

**TOTAL: 60 PERIODS**

## **COURSE OUTCOMES:**

At the end of the course, students will be able

- To apply matrix method in reducing quadratic form to canonical form.
- To solve simple optimization problems through differential calculus.
- To evaluate multiple integrals required for solving area and volume problems.
- To apply vector calculus for verifying Green's, Gauss' and Stoke's theorems.
- To solve problems arising in analytic functions and solve real integrals through Cauchy Residue theorem.

## **TEXT BOOKS:**

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44<sup>th</sup> Edition, 2018.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, New Delhi, 10<sup>th</sup> Edition, 2016.
3. Anuradha P and Sudhakar V, "Matrices and Calculus", Scitech Publications, 1<sup>st</sup> Edition, Chennai, 2019.

## **REFERENCES:**

1. Anton H, Bivens I and Davis S, "Calculus", Wiley, 10<sup>th</sup> Edition, 2016.
2. Jain R K and Iyengar S R K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 8<sup>th</sup> Edition, 2022.
3. Srimantha Pal and Bhunia S C, "Engineering Mathematics" Oxford University Press, 1<sup>st</sup> Edition, 2015.
4. Weir, M D and Joel Hass, "Thomas Calculus", 15<sup>th</sup> Edition, Pearson India, 2022.

## **WEB REFERENCES:**

1. <https://nptel.ac.in/courses/111107112>
2. <https://nptel.ac.in/courses/111108157>
3. <https://nptel.ac.in/courses/111107108>
4. <https://nptel.ac.in/courses/111106141>
5. <https://nptel.ac.in/courses/111103070>

## **CO-PO MAPPINGS:**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	3	-	-	-	2	-	-	1
CO2	2	1	1	2	3	-	-	-	2	-	-	1
CO3	2	1	1	2	3	-	-	-	2	-	-	1
CO4	2	1	1	2	3	-	-	-	2	-	-	1
CO5	2	1	1	2	3	-	-	-	2	-	-	1
AVG	2	1	1	2	3	-	-	-	2	-	-	1



<b>JPH2101</b>	<b>ENGINEERING PHYSICS-1</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To enable the students to understand the basics of Properties of Matter
- To expand their knowledge about thermal properties of materials
- To enhance their understanding of Photonics
- To familiarize the students with the principles of quantum mechanics
- To enrich their knowledge on Solid State of Materials

**UNIT I - PROPERTIES OF MATTER 9**

Elasticity – Stress-strain diagram and its uses - factors affecting elastic moduli and tensile strength - Torsion pendulum: theory and experiment - Bending of beams - stress due to bending in beams - bending moment – Cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment.

**UNIT II - THERMAL PHYSICS 9**

Fundamentals of thermal energy - expansion joints – Bimetallic strips - Thermal conductivity, conduction in solids, Differential equation of one dimensional heat flow – Forbes’s and Lee’s disc method - Conduction through compound media- Solar heater

**UNIT III - LASERS AND FIBER OPTICS 9**

Spontaneous and stimulated emission-Population inversion -Einstein’s A and B coefficients derivation – Laser Principle – Nd:YAG and Semiconductor lasers (homojunction & heterojunction) Principle and propagation of light in optical fiber, Derivation of Numerical aperture and Acceptance angle – Fiber optical communication (Block diagram) – Active and passive sensors – Medical endoscope.

**UNIT IV - BASIC QUANTUM PHYSICS 9**

Black body radiation –Planck’s theory (derivation) –Deduction of Wien’s displacement law and Rayleigh –Jeans’ Law from Planck’s theory –Compton effect-theory –Properties of Matter waves - Schrödinger's wave equation –Time independent and time dependent equations –Physical significance of wave function –Particle in a one dimensional box –Scanning Transmission electron microscope.

**UNIT V - SOLID STATE PHYSICS 9**

Single crystal, Polycrystalline and Amorphous materials – Single Crystals: Unit cell, Crystal systems, Bravais lattices, Directions and Planes in a crystal, Miller indices – Inter planar distances – Coordination number and Packing factor for SC, BCC, FCC, HCP and Diamond structures - Crystal imperfections: Point defects, Line defects – Burgers vector, Surface defects and Volume defects.

**TOTAL: 45 PERIODS**



JCY2101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

## **COURSE OBJECTIVES**

- To inculcate the significance of water quality parameters and water treatment techniques.
- To acquaint the properties and applications of industrial polymers.
- To acquire knowledge in corrosion of material and its prevention.
- To import knowledge over energy conversion methods and of energy storage devices.
- To acquire knowledge on the basics of nanomaterials and its preparatory methods.

**TOTAL: 45 PERIODS**

### **UNIT 1 WATER AND ITS TREATMENT**

9

Water quality parameters (pH, TDS, DO, BOD, COD) - Hardness - Types and estimation (EDTA method). Alkalinity – Types and estimation. Water softening methods- Limesoda Process (Cold and Hot methods) - Zeolite Process - Ion exchange process. Desalination of brackish water –reverse osmosis. Municipal water treatment- Primary treatment and Disinfection (UV, Ozonation, Chlorination) - Break point chlorination.

### **UNIT 2: POLYMER AND COMPOSITES**

9

Classification of polymers – Functionality – Types of polymerisation (addition & condensation) – Mechanism of addition polymerisation (free radical, cationic, anionic) - Degree of polymerization - Thermoplastic and Thermosetting. Bio degradable polymer- Polylactic acid, Polyvinyl acetate- Preparation – Properties – applications. Conducting polymer – types – Mechanism – application - Polymer composites – types – properties and application.

### **UNIT 3 CORROSION AND ITS PREVENTION**

9

Corrosion - chemical, electrochemical corrosion, galvanic corrosion and differential aeration corrosion. Factors influencing the rate of corrosion. Corrosion control - material selection, design aspects, cathodic protection, Corrosion inhibitors - Electroplating (copper) and electroless plating (nickel) – Organic coating (Paints – Constituents and function).

### **UNIT 4 ENERGY SOURCES AND STORAGE DEVICES**

9

Nuclear energy- critical mass light water nuclear power plant and Breeder reactor. Principle, working and applications of solar energy and wind energy. Primary battery (dry cell and alkaline battery). Secondary

battery (lead acid, nickel-cadmium and lithium-ion-battery). H<sub>2</sub>-O<sub>2</sub> fuel cell.

## UNIT 5 NANOCHEMISTRY

9

Distinction between molecules, nanomaterials and bulk materials - Size-dependent properties - Types of nanomaterials - Nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis of nanomaterials - solvothermal, laser ablation, chemical vapour deposition and electrochemical deposition - General applications of nanomaterial.

## COURSE OUTCOMES

- To identify water quality and propose suitable methods to treat water.
- To analyze the compatibility of polymeric materials for biomedical and electronic applications.
- To recognize the nature of corrosive environment and implement preventive methods of corrosion.
- To design different forms of energy sources for suitable applications.
- To identify suitable synthetic method of nanomaterials for specific applications.

## TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
3. A.Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing Company Pvt.Ltd., 22<sup>nd</sup> edition, 2023

## REFERENCES:

1. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
2. 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.
3. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47<sup>th</sup> edition, Vishal

publishing Co, 2017.

4. S. Ananda Kumar (Editor)"Eco-friendly Nano-hybrid materials for Advanced Engineering Applications" CRC Press, USA. (2016)
5. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
6. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2013.

### Website reference:

1. <https://nptel.ac.in/courses/113/101/113101098/>
2. <https://nptel.ac.in/courses/113/106/113106093/>

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	3	1	2	2	2	1	1	-	1
CO2	1	1	1	2	1	2	1	1	-	1	-	1
CO3	1	1	2	2	1	1	1	-	-	1	-	1
CO4	1	1	2	2	1	1	1	1	1	1	-	1
CO5	1	1	1	2	1	-	-	-	-	1	-	1

<b>JGE2101</b>	<b>BASIC ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To provide students with illustrations about mechanical engineering to satisfy societal needs
- To provide them knowledge on refrigeration, air-conditioning and power plants
- To help students acquire knowledge in the basics of surveying and building materials
- To impart knowledge on the electric circuits and working principles of Electrical Machines.
- To provide the knowledge on the Principles and characteristics of various electronic devices and measuring instruments.

**UNIT I – BASICS OF MECHANICAL ENGINEERING 9**

Introduction to the concepts of Mechanization and Automation, Robotics - Manufacturing methods - casting, machining, forming operations. Introduction to IC Engine - Working principles of four stroke petrol and diesel engines. Electric vehicle Technology- Layout, components and control.

**UNIT II–REFRIGERATION, AIR CONDITIONING SYSTEM AND POWER PLANT 9**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Classification of power plant and working principle of Thermal and Hydel power plant.

**UNIT III - BASICS OF CIVIL ENGINEERING 9**

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials. Surveying: Objects – Classification – Principles – Measurements of Distances and angles. Rain Water Harvesting, Solid Waste Management

**UNIT IV ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 9**

Basic circuit components - Ohms Law - Kirchhoff's Law – Introduction to AC circuits - Power and power factor –Construction, Principle of operation and characteristics of DC machines ,Transformers and Induction machines.

Types of Materials - N type and P type materials - Principle of operation and Characteristics: PN Junction diode , Zener Diode, BJT, MOSFET. Elements of generalized measurement system — Operating forces– Principle of operation of moving coil and moving iron instruments -Errors in measurement - Standards of Measurement.

**COURSE OUTCOMES: At the end of the course, the student will be able**

- To be acquainted with the concepts in mechanical engineering and vehicle concept.
- To understand the fundamentals of refrigeration, air-conditioning and power plant.
- To summarise the surveying, planning of building, infrastructure and building materials.
- Apply the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and choose appropriate instruments for electrical measurement for a specific application.

**TEXT BOOKS:**

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.
2. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
3. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Mc Graw Hill, 2015.
4. D P Kothari and I.J Nagarath, , “ Electrical Machines - Basic Electrical and Electronics Engineering” , Third Reprint , Mc Graw Hill Education (India) Private Limited, , 2016.
5. A.K.Sawhney, “ A Course in Electrical & Electronic Measurements & Instrumentation” , Dhanpat Rai and Co, 2010.
6. S Salivahanan , N Suresh Kumar, "Electronic Devices And Circuits ", fifth Edition, Mc Graw Hill, 2022.

**REFERENCE BOOKS:**

1. Ramamrutham S., “Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P) Ltd, 2013.
2. Ali Emadi, &quot;Advanced Electric Drive Vehicles&quot;, CRC Press, First edition 2017.

3. Thereja. B.L., “ Fundament also f Electrical Engineering and Electronics” , S. Chand &Co.Ltd., 2008.
4. H.S.Kalsi, “Electronic Instrumentation “ , Tata Mc Graw-Hill, 2010.

**WEB SITE REFERENCE:**

1. <https://archive.nptel.ac.in/courses/112/103/112103262/>
2. <https://archive.nptel.ac.in/courses/112/105/112105129/>
3. <https://archive.nptel.ac.in/courses/105/106/105106201/>
4. <https://archive.nptel.ac.in/courses/105/106/105106201/>
5. <https://youtu.be/LPcQYXjPdIQ?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV>
6. <https://www.youtube.com/playlist?list=PLMYtBmvT7X7QaLu0b0Jn1QQD4EOuT CA>
7. <https://youtu.be/5ZNeDxfgYAEhttps://youtu.be/36j6hCtL0E>

**CO-PO & PSO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-	-
CO5	1	1	1	1	1	-	-	-	-	-	-	-



<b>JCS2121</b>	<b>PROGRAMMING IN C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

## **COURSE OBJECTIVES**

- To understand the concepts of C Language.
- To implement programs using basic constructs of C
- To develop C programs using Arrays and Strings
- To develop modular applications in C using functions and Pointers.
- To be able to use File operations and Structures in C.

### **UNIT I INTRODUCTION TO C PROGRAMMING 9**

Introduction to programming paradigms - Simple model of Computer - Algorithms and Flowcharts - Structure of C program - Applications of C Language - Data Types – Constants - Enumeration - Keywords – Number System.

### **UNIT II OPERATOR AND EXPRESSIONS 9**

Data Input and Output statements – Operators: Arithmetic Operators, Relational Operators, Logical Operators, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation – Decision Making and Branching – Looping statements.

### **UNIT III ARRAYS AND STRINGS 9**

Arrays – Initialization – Declaration – One dimensional array – Two dimensional arrays - String - String operations: length, compare, concatenate, copy – Arrays of strings - Simple programs: Sorting, Searching and Matrix operations.

### **UNIT IV FUNCTIONS AND POINTERS 9**

Function – Definition of function – Function Prototypes - Pass by value - Pass by reference - Recursion. Pointers: Definition- Initialization -Pointer Arithmetic- Pointers and Arrays.

### **UNIT V STRUCTURES, UNION AND FILES 9**

Structure - Structure Definition - Structure Declaration - Nested structures - Array of structures - Union - Storage Classes - Files - Types of file processing: Sequential access, Random access - Sequential access file - Random access file - Command line arguments.

**TOTAL: 45 PERIODS**

## **LIST OF EXPERIMENTS**

1. Usage of Basic Linux commands.
2. C Programming using Simple I/O Statements, operators and expressions.
3. C Programming using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings.
6. C Programming using user defined functions (Pass by value and Pass by reference).
7. C Programming using Recursion.
8. C Programming using Pointers and Array of Pointers.
9. C Programming using structures and union.

10. C Programming using storage classes.
11. C Programming using Files.

**TOTAL: 30 PERIODS**

### **COURSE OUTCOMES:**

**On completion of the course, the students should be able to:**

- Develop efficient algorithms for solving a problem.
- Develop simple applications using various operators in C.
- Design and Implement applications using Array and Strings.
- Develop applications using Functions and Pointers.
- Design and Develop applications using Structures and Files.

### **TEXT BOOKS**

1. Paul J. Deitel, Harvey M. Deitel, “C: How to Program”, 9<sup>th</sup> Edition, Prentice Hall.
2. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
3. E. Balaguruswamy, “Programming in ANSI C”, 8<sup>th</sup> Edition, 2019, McGraw Hill Education.
4. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 16<sup>th</sup> edition 2017.

### **REFERENCE BOOKS**

1. Pradip Dey, Manas Ghosh, “Programming in C”, 2<sup>nd</sup> Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
2. Kernighan B.W and Dennis M. Ritchie, “The C Programming Language”, 2<sup>nd</sup> Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
3. Jacqueline A Jones and Keith Harrow, “Problem Solving with C”, Pearson Education. ISBN: 978-93-325-3800-9.
4. PradipDey, ManasGhosh, “Programming in C - As per the latest AICTE syllabus”, First Edition, Oxford University Press, 2018.
5. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Third Edition, McGraw- Hill, 2010.

### **WEBSITE REFERENCES**

1. <http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html>
2. <https://nptel.ac.in/courses/106/105/106105171/>
3. <https://www.w3resource.com/c-programming-exercises/>
4. <https://www.programiz.com/c-programming/c-structures-pointers>
5. <https://www.sitesbay.com/cprogramming/c-applications>

### **CO-PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	2	2	2	2	-	-	-	3	2	2	-	2
<b>CO2</b>	3	3	3	3	-	-	-	3	3	3	-	3
<b>CO3</b>	3	3	3	3	-	-	-	3	3	3	-	3
<b>CO4</b>	3	3	3	3	-	-	-	3	3	3	-	3
<b>CO5</b>	3	3	3	3	-	-	-	3	3	3	-	3

**UNIT I LANGUAGE AND LITERATURE 3**

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

**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, Leatherpuppetry, 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 other parts 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: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

## தமிழர் மரபு

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### 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 திருவள்ளூர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

### அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

### அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:

3

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, கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

**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. பொருறை – 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: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

**GE3171 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY L T P C**  
**0 0 4 2**

**COURSE OBJECTIVES:**

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.

2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

#### REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

### TAMILS AND TECHNOLOGY

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**UNIT I WEAVING AND CERAMIC TECHNOLOGY 3**  
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

**UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3**  
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

**UNIT III MANUFACTURING TECHNOLOGY 3**  
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3**  
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoempu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

**UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3**  
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**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. பொருளை – 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: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

## தமிழரும் தொழில்நுட்பமும்

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### அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்:

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள். 3

### அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. 3

### அலகு III உற்பத்தித் தொழில் நுட்பம்:

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை 3

உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

**அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3**

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

**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. பொருளை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
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Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.



JPC2111	ENGINEERING PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
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**OBJECTIVES:**

To provide students the firsthand experience of verifying various concepts learnt in theory courses.

**LIST OF EXPERIMENTS**

1. Determination of Young's Modulus for the given Uniform bar by Uniform Bending method
2. Determination of Moment of Inertia of the given Circular disc and Rigidity Modulus of thin metal wire using Torsional Pendulum
3. Determination of Planck' constant using different color filters
4. Determine the Wavelength of Mercury Spectrum using Spectrometer.
5. Determine the Thermal conductivity of a Bad conductor using Lee's Disc
6. Determination of Wavelength of the Diode Laser and hence determine the Size of the coated powder particle
7. Estimation of Alkalinity of Water Sample.
8. Estimation of Total, Temporary and Permanent Hardness of Water by EDTA method.
9. Determination of Molecular Weight of a Polymer by Viscosity Average method
10. Estimation of Amount of an Acid by Conductometric Titration
11. Estimation of Ferrous ions by Potentiometric Titration
12. Estimation of Amount of Hydrochloric Acid using p H Meter.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

Students will be able

1. To evaluate elasticity of a linear body.
2. To discriminate different wavelengths of optical spectrum and the behavior of particles and waves at the atomic scale.
3. To identify the materials which are utilized for thermal insulation.
4. To estimate and analyse the amount of hardness and alkalinity in water for domestic consumption.
5. To apply the principles of conductivity and viscosity of substances in aqueous solutions for quantitative analysis using analytical instruments.

**REFERENCES:**

1. D. Bailey and E. Wright, Practical Fiber Optics, 2003.
2. Jerrad H.G. and Mc Neil D.B. -Theoretical and Experimental Physics.
3. Fretter W.B. -Introduction to Experimental Physics.
4. J. Mendham, RC Denney, JD Barnes, MJK Thomas, Text book of quantitative chemical analysis, Vogel's, 2008.

## WEBSITE REFERENCES

1. <https://www.jhotpotinfo.com/2020/02/determination-of-youngs-modulus-of-bar.html>
2. <https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1518&cnt=1>
3. <https://vlab.amrita.edu/?sub=1&brch=281&sim=851&cnt=2>
4. [http://sites.iiserpune.ac.in/~bhasbapat/phy221\\_files/Lee%27s%20Method.pdf](http://sites.iiserpune.ac.in/~bhasbapat/phy221_files/Lee%27s%20Method.pdf)
5. [https://edisciplinas.usp.br/pluginfile.php/4212400/mod\\_resource/content/0/Dunnivant%2021.pdf](https://edisciplinas.usp.br/pluginfile.php/4212400/mod_resource/content/0/Dunnivant%2021.pdf)
6. [https://chem.libretexts.org/Bookshelves/General\\_Chemistry/Map%3A\\_A\\_Molecular\\_Approach\\_\(Tro\)/17%3A\\_Aqueous\\_Ionic\\_Equilibrium/17.04%3A\\_Titrations\\_and\\_pH\\_Curves](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_A_Molecular_Approach_(Tro)/17%3A_Aqueous_Ionic_Equilibrium/17.04%3A_Titrations_and_pH_Curves)

## CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	1	1	-	-	2	1	-	1
CO2	1	1	1	2	1	1	-	-	2	1	-	1
CO3	1	1	1	2	1	1	-	-	2	1	-	1
CO4	1	1	1	2	1	1	-	-	2	1	-	1
CO5	1	1	1	2	1	1	-	-	2	1	-	1

<b>JGE2111</b>	<b>BASIC ENGINEERING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

## **COURSE OBJECTIVES**

- To provide an exposure to students with hands-on experience on various basic engineering practices in Civil, Mechanical Engineering
- To impart knowledge on creativity, ideation and realize the importance of team working
- To gain knowledge through experience in handling of engineering aggregates.
- To appreciate the use of various mechanisms involved in engineering products like vehicles.
- To provide exposure to the students with hands-on experience on various basic engineering practices in Electrical and Electronics Engineering
- To kindle your own creativity, ideation and realize the importance of team working.
- To gain knowledge through experience in handling of engineering aggregates.

## **GROUP A**

### **I CIVIL ENGINEERING PRACTICE**

#### **BUILDINGS:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

#### **PLUMBING WORKS:**

- a) Study of pipe line joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- b) Hands-on-exercise: Basic pipe connections - Mixed pipe material connection Pipe connections with different joining components.

### **II MECHANICAL ENGINEERING PRACTICE**

#### **WELDING AND DRILLING**

- (a) Preparation of but joints, lap joints and T-joints by Shielded metal arc welding.
- (b) Drilling Practice

#### **TWO WHEELER DISMANTLING AND DIAGNOSIS**

- Brake Adjustment and Replacing
- Chain Adjustment and lubrication
- Air Filter and Spark plug Cleaning
- Engine oil Replacement and Carburetor Tuning

### **STUDY AND DEMONSTRATION ON:**

- (a) Study of Lathe Machine, tools and components, Safety aspects
- (b) Study of Sheet Metal work, tools and components, Safety aspects

### **GROUP B**

#### **I ELECTRICAL ENGINEERING PRACTICE**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring
4. Measurement of electrical quantities -voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

#### **II ELECTRONICS ENGINEERING PRACTICE**

1. Study of Electronic components and equipment's - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

### **COURSE OUTCOMES:**

At the end of the course, students will be able

- To fabricate carpentry components and pipe connections including plumbing works.
- To weld various joints in steel plates using arc welding work.
- To understand various mechanism involved in automobiles.
- To illustrate on lathe machine and sheet metal work.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

### **WEBSITE REFERENCE:**

1. <https://nptel.ac.in/courses/107106088>
2. [www.vikaspublishing.com/engineering-practices-lab](http://www.vikaspublishing.com/engineering-practices-lab)
3. <https://archive.org/mechanicalengineeringworkshoplaboratory>

<b>JHS2221</b>	<b>ENGLISH FOR SCIENCE AND TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

**Course Objectives:**

- To enable the students of Engineering to comprehend technical texts
- To improve their technical writing skill for better transmission of messages
- To help them acquire language skills required in academic and workplace contexts
- To facilitate them to hone their skills to prepare effective reports
- To equip them with effective communicative skills to meet their future needs

**UNIT I Communicating Technical Information** **12**

Definitions – Conditional clauses – Technical vocabulary; Comprehension of short technical passage and note-making

**Language Practice**

**Reading:** Short technical texts / excerpts; **Speaking:** Interviewing on social or global issues; **Listening:** Talks on science, engineering, medicine / interviews of achievers; **Writing:** Sentence Completion, gap filling, verbal aptitude: sentence correction

**UNIT II Graphical Analysis and Interpretation** **12**

Purpose statements – Numerical adjectives – Collocation; Process Description - Interpretation of Graphs and Charts

**Language Practice**

**Reading:** Emails, invitations; **Speaking:** Describing charts and tables; **Listening:** Process descriptions; **Writing:** Paraphrasing – Developing outlines

**UNIT III Persuasive Writing and Information Dissemination** **12**

Cause and effect – Voice (active, personal and impersonal passive) – Words used as nouns and verbs; Instructions – Recommendations

**Language Practice**

**Reading:** User manuals, gadget reviews; **Speaking:** Presentation on social / technical topics; **Listening:** Announcements, instructions; **Writing:** Instructions – Recommendations

**UNIT IV Report Writing and Group Interaction** **12**

Determiners – Editing - Initialisms and acronyms; Report writing: survey, accident – Minutes of meeting

**Language Practice**

**Reading:** Notices, reviews; **Speaking:** Group discussions (technical topics) and debates; **Listening:** IELTS and TOEFL; **Writing:** Writing profiles of personalities and industries

**UNIT V Career and Business Communication** **12**

Adverbials – Misspelt words – Formal and informal English; Letter writing – Job application and resume by mail and email – Inviting and sending quotations and placing orders

**Language Practice**

**Reading:** Email invitations to job interviews; **Speaking:** About future / career; **Listening:** Talks by entrepreneurs; **Writing:** Career objective, short-term and long-term goals, tagline

**TOTAL: 60 PERIODS**

## Course Outcomes:

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

- To read and understand different types of technical texts
- To write procedural texts logically and sequentially in English
- To communicate effectively in academic and professional contexts
- To prepare effective reports and participate in group activities
- To use language precisely and accurately in business relations

### Text Books:

1. Department of English, Anna University, Fluency in English, Orient BlackSwan Private Limited, Chennai, 2018.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering, Orient BlackSwan Private Limited, Chennai, 2011.
3. Interact English: Lab Manual for Undergraduate Students, Orient BlackSwan Private Limited. Chennai, 2017.

### Reference Books:

1. Chellammal, V. Learning to Communicate, Allied Publishing House, New Delhi, 2004.
2. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: Principles and Practices, Oxford University Press, New Delhi, 2015.
3. Regional Institute of English. English for Engineers, Cambridge University Press, New Delhi, 2008.
4. Rizvi M, Ashraf. Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

### Web Links:

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishgrammar.org](http://www.englishgrammar.org)
3. [www.englishclub.com](http://www.englishclub.com)
4. [www.usingenglish.com](http://www.usingenglish.com)
5. [www.esl.about.com](http://www.esl.about.com)
6. [www.bbc.co.uk/learningenglish/](http://www.bbc.co.uk/learningenglish/)
7. <https://esl-bits.net/>
8. <https://elt.oup.com/>
9. <https://learnenglish.britishcouncil.org>
10. <https://quizizz.com/>

### Mapping of PO with CO

	1	2	3	4	5	6	7	8	9	10	11	12
CO-1	-	-	-	1	-	1	-	1	1	3	-	1
CO-2	-	-	-	1	-	1	-	1	1	3	-	1
CO-3	-	-	-	1	-	1	-	1	1	3	-	1
CO-4	-	-	-	1	-	1	-	1	1	3	-	1
CO-5	-	-	-	1	-	1	-	1	1	3	-	1

2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

**TAMILS AND TECHNOLOGY**

**L T P C**  
**1 0 0 1**

**UNIT I WEAVING AND CERAMIC TECHNOLOGY 3**  
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

**UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3**  
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

**UNIT III MANUFACTURING TECHNOLOGY 3**  
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

**UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3**  
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoempu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

**UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3**  
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**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. பொருளை – 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: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

## தமிழரும் தொழில்நுட்பமும்

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### அலகு I நெசவு மற்றும் பானைத் தொழில்நுட்பம்:

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள். 3

### அலகு II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்:

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. 3

### அலகு III உற்பத்தித் தொழில் நுட்பம்:

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை 3



உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

**அலகு IV வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3**

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

**அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3**

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

**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. பொருளை – 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: International Institute of Tamil Studies.)
  7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies.)
  8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
  9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
  10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
  11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
- Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

<b>JMA2201</b>	<b>STATISTICS FOR ENGINEERS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>2</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To provide basic concepts of discrete, continuous random variables and moments.
- To acquaint students in the concepts and problems of standard distributions.
- To familiarize students in problems of correlation and regression.
- To provide students knowledge of testing of hypothesis and its applications.
- To introduce Design of Experiments for practical problem solving.

**UNIT I RANDOM VARIABLES** **12**  
 Discrete and continuous random variables – Moments – Moment generating functions.

**UNIT II STANDARD DISTRIBUTIONS** **12**  
 Discrete distributions: Binomial distribution – Poisson distribution – Geometric distribution.  
 Continuous distributions: Uniform distribution – Exponential distribution – Normal distribution.

**UNIT III STATISTICAL CORRELATION AND REGRESSION** **12**  
 Correlation coefficient – Rank correlation – Correlation for bivariate data – Regression coefficients – Lines of regression.

**UNIT IV TESTING OF HYPOTHESIS** **12**  
 Normal tests for mean and difference of means – t tests for mean and difference of means – Chi-square test for goodness of fit – Chi-square test for independence of attributes.

**UNIT V DESIGN OF EXPERIMENTS** **12**  
 ANOVA classification – Completely Randomized Design – Randomized Block Design – Latin Square Design.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, students will be able

- To solve problems of discrete and continuous type random variables for finding mean and variance.
- To apply standard probability distributions in solving real time problems.
- To solve correlation problems and to use regression analysis for predicting values of variables.
- To apply hypothesis testing for making statistical inferences in large and small sample real life problems.
- To compare and contrast various design of experiments methods and use them in problems.

**TEXT BOOKS:**

1. Gupta S C and Kapoor V K, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 12<sup>th</sup> Edition, 2020.
2. Ibe O C, "Fundamentals of Applied Probability and Random Processes", Elsevier, 2<sup>nd</sup> Edition, 2014.
3. Johnson R A, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9<sup>th</sup> Edition, 2018.

**REFERENCES:**

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 3<sup>rd</sup> Edition 2014.
2. Trivedi K S, "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, 2<sup>nd</sup> Edition, 2016.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/117105085>
2. <https://nptel.ac.in/courses/111105041>
3. <https://nptel.ac.in/courses/102101056>
4. <https://nptel.ac.in/courses/102106051>

**CO-PO MAPPINGS:**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	3	-	-	-	2	1	-	1
CO2	2	1	1	2	3	-	-	-	2	1	-	1
CO3	2	1	1	2	3	-	-	-	2	1	-	1
CO4	2	1	1	2	3	-	-	-	2	1	-	1
CO5	2	1	1	2	3	-	-	-	2	1	-	1
AVG	2	1	1	2	3	-	-	-	2	1	-	1

<b>JPH2201</b>	<b>ENGINEERING PHYSICS – 2</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To enlighten the students on the principles of semiconductor materials and Electron transport properties
- To acquaint them with the applications of magnetic materials
- To impart knowledge on superconducting materials
- To help them acquire a basic understanding of dielectric materials
- To introduce the basic principles in nano electronic devices

**UNIT I – SEMICONDUCTING MATERIALS 9**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Hall Effect- Hall Coefficient in N-type and P-type semiconductors.

**UNIT II – MAGNETIC MATERIALS 9**

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism Domain theory – Hysteresis – Soft and Hard magnetic materials– Ferrites and its applications – Memory devices-ROMs and RAMs(R/W)

**UNIT III – SUPERCONDUCTING MATERIALS 9**

Properties of Superconductors – Josephson junction - Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) – High Tc superconductors - Applications – SQUIDS. Cryotron and Maglev train.

**UNIT IV – DIELECTRIC MATERIALS 9**

Polarization mechanisms in dielectrics– dielectric loss – internal field – Clausius-Mosotti relation- dielectric loss and dielectric breakdown – high-k dielectrics – Types of dielectrics – Applications in transformers and capacitors.

**UNIT V – NANOELECTRONIC MATERIALS 9**

Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures - Single electron phenomena and Single Electron Transistor.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Students will be able

- To be familiar with the functioning of semiconductors
- To assess the magnetic properties of materials
- To make use of superconductors in real life situations
- To understand the nuances of advanced solid state physics
- To recognize the uses of Nano electronic materials

**TEXT BOOKS:**

1. Dr.P.Mani, "Engineering Physics – II", Dhanam Publications, First Edition, 2019.
2. Dr.G.Senthil Kumar "Engineering Physics – II", VRB Publications, Revised Edition 2018.
3. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
4. S.O.Pillai, "Solid State Physics", New Age International Publications, Revised Edition.
5. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
6. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

**REFERENCES:**

1. R. Murugesan, "Modern Physics", Sultan chand & sons, 2021.
2. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2020.
3. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2017.
4. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics".
5. Willam F Smith, "Material Science and Engineering", Tata McGraw - Hill Publications, 4<sup>th</sup> Edition.

**WEBSITE REFERENCES:**

1. <https://archive.nptel.ac.in/courses/108/108/108108122/>
2. <https://archive.nptel.ac.in/courses/115/103/115103038/>
3. <https://archive.nptel.ac.in/courses/115/103/115103108/>
4. [https://www.brainkart.com/article/Dielectric-Materials\\_6827/](https://www.brainkart.com/article/Dielectric-Materials_6827/)
5. <https://archive.nptel.ac.in/courses/117/108/117108047/>

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>1</b>	-	-	<b>1</b>	-	-	<b>1</b>	-	-	<b>1</b>
<b>CO2</b>	<b>3</b>	<b>2</b>	<b>1</b>	-	-	<b>1</b>	<b>1</b>	-	-	-	-	<b>1</b>
<b>CO3</b>	<b>3</b>	<b>2</b>	<b>1</b>	-	-	-	-	-	-	-	-	<b>1</b>
<b>CO4</b>	<b>3</b>	<b>2</b>	<b>1</b>	-	-	-	-	-	-	-	-	<b>1</b>
<b>CO5</b>	<b>3</b>	<b>2</b>	<b>1</b>	-	-	-	<b>1</b>	-	-	-	-	<b>1</b>

<b>JCY2201</b>	<b>ENVIRONMENTAL SCIENCE AND SUSTAINABILITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>

### **COURSE OBJECTIVES:**

- To study the inter-relationship between living organisms and environment.
- To learn causes, effects and preventive methods of environmental pollution.
- To import knowledge on the needs of renewable and new energy sources.
- To acquire broad knowledge on sustainable development and its values on society.
- To expertise sustainability practices of sustainable habitat, sustainable energy and green engineering.

### **UNITI ENVIRONMENT AND BIODIVERSITY 6**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow–ecological succession. Biodiversity – Types and values. India as mega-diversity nation–hot-spots of biodiversity - endangered and endemic species of India – threats to biodiversity –conservation of biodiversity - In-situ and ex-situ - Field visit

### **UNITII ENVIRONMENTAL POLLUTION 6**

Causes, Effects and preventive measures of water, air, soil and thermal pollution. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHSMS).Environmental protection acts - Field visit

### **UNITIII RENEWABLE SOURCES OF ENERGY 6**

Energy management and conservation – Need of new energy sources- Applications of- Hydrogen energy - Ocean energy resources - Tidal energy conversion. Concept, origin and power plants of geothermal energy.

### **UNITIV SUSTAINABLE DEVELOPMENT 6**

Sustainability- concept, needs and challenges- economic and social aspects of sustainability – millennium development goals and protocols- Sustainable Development Goals - targets, indicators and intervention areas. Climate change - Global, Regional and local environmental issues and possible solutions - case studies. Concept of carbon credit and carbon footprint.

### **UNITV SUSTAINABILITY PRACTICES 6**

Zero waste and 3R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency and sustainable transports. Sustainable energy: Energy Cycles - carbon cycle, emission and sequestration. Green Engineering: Sustainable urbanization - Socio-economic and technological change.

**TOTAL: 30 PERIODS**

## **COURSE OUTCOMES**

At the end of course completion, students will be able

- To recognize the function of ecosystem and contribute to conservation of biodiversity.
- To identify the causes and effects of environmental pollution and practice the preventive measures.
- To recognize various types of new renewable sources of energy and their potential applications.
- To apply the sustainable development goals for technological advancement and societal development.
- To adopt sustainability practices for energy efficiency and sustainable urbanization.

## **TEXT BOOKS:**

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.
3. Sanjay K Sharma, Green Corrosion Chemistry and Engineering: Opportunities and challenges, Wiley-VCH Verlag GmbH & Co. KGaA, Germany (2011).
4. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition,Pearson Education, 2004.

## **REFERENCES:**

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. ErachBharucha "Textbook of Environmental Studies for Undergraduate Courses" OrientBlackswan Pvt. Ltd. 2013.

## **Related Links**

1. <https://www.hzu.edu.in/bed/E%20V%20S.pdf>
2. <https://catalogimages.wiley.com/images/db/pdf/9781119582052.excerpt.pdf>
3. <https://ncert.nic.in/textbook/pdf/keec109.pdf>

## CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	-	-	2	3	2	-	1	-	1
CO2	1	1	1	-	-	2	3	3	-	1	-	1
CO3	1	1	2	-	-	2	3	2	-	1	-	1
CO4	1	1	2	-	-	2	3	3	-	1	-	1
CO5	1	1	1	-	-	2	3	3	-	1	-	1



<b>JGE2221</b>	<b>ENGINEERING GRAPHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To acquaint students with the importance of graphics in engineering
- To develop their skills in the preparation of basic drawing
- To improve their technical communication skill in the form of communicative drawing
- To impart knowledge about standard principle of orthographic projection of objects
- To improve their visualization skills for developing new products

### **UNIT ICONIC SECTIONS AND SPECIAL CURVES 12**

Conics - Construction of ellipse, Parabola and hyperbola by eccentricity method , Rectangle method- Drawing of tangents and normal to the above curves.

Special curves: Cycloid-Involute-Drawing of tangents and normal to the curves.

### **UNIT II PROJECTION PLANE SURFACES AND ORTHOGRAPHIC PROJECTIONS 12**

Introduction to Points, Lines (Only theory not for Exam Practice) – Projection of Plane Surfaces- Projection of polygonal surface and circular lamina inclined to both reference planes.

Representation of Three Dimensional objects - General principles of orthographic projection – Need for importance of multiple views and their placement - First angle projection - layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

### **UNIT III PROJECTION OF SOLIDS 12**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

### **UNIT IV DEVELOPMENT OF SURFACES 12**

Introduction to Section of Solids (Only theory not for Exam Practice)

Development of lateral surfaces of simple and truncated solids - Prisms, pyramids, cylinders and cones.

Principles of isometric projection – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Conversion of orthographic views into Isometric Drawing (Simple Objects) - Perspective projection of prisms and pyramids by visual ray method.

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

On successful completion of this course, the student will be able

- To be familiar with the fundamental and standards of engineering graphics.
- To perform free hand sketching of basic geometrical constructions and multiple views of object.
- To project orthographic projections of lines and plane surfaces.
- To draw projection of solids and development of surfaces.
- To interpret isometric and perspective view of objects.

**TEXT BOOKS:**

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2016.

**REFERENCES:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53<sup>rd</sup> Edition, 2019.
2. Gopalakrishna K.R., “Engineering Drawing” (Vol. I & II combined), Subhas Stores, Bangalore, 2017..
3. Shah M.B and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Publication of Bureau of Indian Standards(BIS):
  - i. IS 10711 - 2001: Technical products Documentation - Size and lay out of drawing sheets.
  - ii. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
  - iii. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
  - iv. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
  - v. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

**Website References:**

1. [www.pdfdrive.com/engineering drawing-books.html](http://www.pdfdrive.com/engineering-drawing-books.html)
2. <https://freevideolectures.com>
3. <https://nptel.ac.in/courses>

<b>JEC2201</b>	<b>ELECTRONIC DEVICES AND CIRCUIT ANALYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- To help students understand the basic methods to analyse circuits and concepts of network theorems
- To acquaint the students with in-depth knowledge of the characteristics of electronic diodes.
- To familiarize the working, characteristics and applications of BJT
- To make students understand the characteristics and different operating modes of FET, MOSFET.
- To familiarize students with working of special electronic devices such as UJT, Tunnel diode and power devices such as SCR, TRIAC etc.

### **UNIT I      CIRCUIT ANALYSIS FUNDAMENTALS      9**

Passive and Active elements, Source transformation rules, Star-Delta conversion, Kirchhoff's laws, Mesh Analysis and Nodal Analysis, Quantitative Analysis of Network Theorems - Thevenin's and Norton Theorems, Super position Theorem, Maximum power transfer theorem, Fundamental of Resonance circuits, Basics of coupled circuits.

### **UNIT II      DIODE AND APPLICATIONS      9**

PN junction diode – Biasing, energy band diagram, V-I Characteristics, Drift and Diffusion currents, Space charge width, Capacitances associated with PN junction diode, Varactor diode, Breakdown diodes – Zener and Avalanche mechanism, Zener diode as regulator, Design of power supply, Clipper and Clamper.

### **UNIT III      BIPOLAR JUNCTION TRANSISTOR      9**

Types, current components. CB, CE, CC configurations – current gain and relations, input and output characteristics, h-parameter model of BJT, Quantitative analysis of current gain, voltage gain, input impedance and output admittance of transistor configurations, Applications- BJT as transistors.

### **UNIT IV      FIELD EFFECT TRANSISTORS      9**

Classifications of FET, JFETs – Types, construction and operation, Channel length modulation, characteristics. JFET parameters, Quantitative measure of drain current and Pinch off voltage, MOSFET- Characteristics of MOSFET, JFET Vs MOSFET, MOSFET as switch.

### **UNIT V      SPECIAL SEMICONDUCTOR DEVICES & POWER DEVICES      9**

Unijunction Transistor and applications, Thyristor - Schottky barrier diode, SCR, TRIAC, DIAC, Applications- Tunnel diode, Photo diode, Phototransistor, Opto Coupler, Photo Voltaic Cells, CCD, Case study on Solar energy.

**TOTAL PERIODS: 45**

### **COURSE OUTCOMES:**

**At the end of the course the students will be able to**

- Apply and analyse circuits using network theorems
- Explain the characteristics of semiconductor diodes
- Explain the working, characteristics and applications of BJT
- Explain the characteristics of FET, MOSFET
- Comprehend the characteristics of various electronic components and power devices

**TEXTBOOKS:**

1. Jacob Millman, Christos C. Halkias and SatyabrataJit, Millmans Electronic Devices and Circuits, Fourth edition, McGraw Hill, 2015
2. William H. Hayt, Jack Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, McGraw Hill, 2013.

**REFERENCES:**

1. Albert Paul Malvino, “Electronic Principles”, 7th Edition, Mcgraw Hill Publication, 2017
2. Salivahanan. S and Suresh Kumar S. N, —Electronic Devices and circuit, Fourth Edition, Tata McGraw- Hill, 2016.
3. R. S. Sedha, A Textbook of Electronic Devices and Circuits, Second Edition, S. Chand Publishing, 2008.
4. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”,McGraw Hill, 2015.

**WEBSITE REFERENCES:**

1. <https://archive.nptel.ac.in/courses/108/105/108105112/>
2. <https://nptel.ac.in/courses/108/102/108102042/>
3. <https://nptel.ac.in/courses/117/103/117103063/>
4. <https://archive.nptel.ac.in/courses/117/107/117107095/>
5. <https://www.elprocus.com/semiconductor-devices-types-and-applications/>

**CO – PO/PSO MAPPING:**

CO\PO- PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	-	-	-	-	3	3	2	3	2
CO2	3	3	2	3	2	2	-	-	-	-	3	3	2	3	2
CO3	3	3	3	3	2	1	-	-	-	-	3	3	2	3	3
CO4	3	3	2	3	2	2	-	-	-	-	2	3	2	3	3
CO5	3	3	3	3	2	2	-	-	-	-	3	3	2	3	3
AVG	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	-	-	-	-	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2.6</b>

JPC2211	ENGINEERING PHYSICS AND ENVIRONMENTAL SCIENCE LABORATORY	L	T	P	C
		0	0	2	1

#### OBJECTIVES:

To provide students the first hand experience of verifying various concepts learnt in theory courses.

#### LIST OF EXPERIMENTS:

1. Determination of Numerical Aperture of the given Fiber and Estimate the Linearity of the Laser Source.
2. Determine the Dispersive power of a given Prism using Spectrometer
3. Determination of Thickness of the given thin Wire by forming Interference fringes using air-wedge setup
4. Analysis of I-V Characterization of Solar cell
5. Determination of Energy gap of the given Semiconductor Diode by plotting the graph between current and temperature.
6. Determination of Young's Modulus for the given bar by Nonuniform Bending method.
7. Determination of Dissolved oxygen by Winkler's method
8. Estimation of amount of chloride in water.
9. Estimation of the amount of mixture of acids in water
10. Estimation of Iron content in water by Spectrophotometric method
11. Estimation of acetic acid adsorbed on charcoal.
12. Determination of per capita energy consumption and carbon footprint.

**TOTAL: 30 PERIODS**

#### COURSE OUTCOMES

At the end of the course, the students will able

1. To lucid the effective communication system and to scrutiny the required wavelength.
2. To quantify micro sized linear objects and to ascertain band gap of semiconducting materials.
3. To configure solar power system as close as possible to its maximum peak power point.
4. To quantify the degree of pollution of water samples by measuring water quality parameters.
5. To carry out energy audit and practice energy conservation methods.

#### REFERENCES

1. D. Bailey and E. Wright, Practical Fiber Optics, Newnes publications, 2003.
2. Fretter W.B. -Introduction to Experimental Physics UCL Press, 2005
3. Gurdeep R.Chatwal, Sham K. Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2007.

**WEBSITE REFERENCES:**

1. <https://vlab.amrita.edu/?sub=1&brch=281&sim=851&cnt=2>
2. <https://anilpangantiwar.tripod.com/expt10.htm>
3. <https://praxilabs.com/en/3d-simulations/i-v-characteristics-of-solar-cell-i-physics-simulation>
4. <https://vlab.amrita.edu/?sub=2&brch=193&sim=575&cnt=1>
5. <https://jigyasa-csir.in/neeri/n32-t1-a2/>

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	2	1	1	-	-	2	1	-	1
CO2	1	1	2	2	1	1	-	-	2	1	-	1
CO3	1	1	2	2	1	1	-	-	2	1	-	1
CO4	1	1	2	2	1	2	-	-	2	1	-	1
CO5	1	1	2	2	1	2	-	-	2	1	-	1

<b>JEC2211</b>	<b>ELECTRONIC DEVICES AND CIRCUIT ANALYSIS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **COURSE OBJECTIVES:**

- To verify the characteristics of diodes
- To verify the characteristics of BJT, FET, UJT, SCR
- To demonstrate the use of KVL & KCL
- To verify various Network Theorems in Circuit analysis.
- To demonstrate the frequency response and transient behaviour of RL, RC and RLC circuits

### **LIST OF EXPERIMENTS**

1. Demonstrate of characteristics of PN Junction Diode and its application: clipper, clamper and Full Wave Rectifier
2. Investigate and plot the characteristics of Zener diode and its application as voltage regulator
3. Investigate and plot input-output characteristics of BJT in Common Emitter Common Base Configuration
4. Investigate the Characteristics of FET
5. Investigate the Characteristics of UJT
6. Demonstrate the characteristics of SCR
7. Verification of KVL & KCL
8. Verification of Thevenin & Norton theorems
9. Verification of Super Position Theorem
10. Verification of maximum power transfer & reciprocity theorems
11. Determination of resonant frequency of series & parallel RLC Circuits

**TOTAL: 60 PERIODS**

### **COURSE OUTCOMES:**

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

- Verify the characteristics of diodes
- Verify the characteristics of BJT, FET, UJT, SCR
- Demonstrate the use of KVL & KCL
- Verify various Network Theorems in Circuit analysis.
- Demonstrate the frequency response and transient behaviour of RL, RC and RLC circuits

### **LABORATORY REQUIREMENTS:**

1. BC 107, BC 148, 2N2646, BFW10 - 25 each
2. 1N4007, Zener diodes - 25 each
3. Resistors, Capacitors, Inductors - sufficient quantities
4. Bread Boards - 15 Nos
5. CRO (30MHz) – 10 Nos.
6. Function Generators (3MHz) – 10 Nos.
7. Dual Regulated Power Supplies (0 – 30V) – 10 Nos.



## WEBSITE REFERENCES:

1. <https://www.youtube.com/watch?v=csxkMy0PYWg>
2. <https://www.youtube.com/watch?v=RPI4AcILfeY>
3. <https://circuitdigest.com/tutorial/rc-rl-and-rlc-circuits>

## CO - PO MAPPING

CO\PO- PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	2	-	-	-	-	2	3	2	3	2
CO2	3	3	2	3	2	2	-	-	-	-	2	3	2	3	2
CO3	3	3	3	3	2	2	-	-	-	-	2	3	2	3	3
CO4	3	3	3	3	2	2	-	-	-	-	2	3	2	3	3
CO5	3	3	3	3	2	2	-	-	-	-	2	3	2	3	3
AVG	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	-	-	-	-	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2.6</b>