

**ANNA UNIVERSITY, CHENNAI**  
**NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY**  
**REGULATIONS 2021**  
**CHOICE BASED CREDIT SYSTEM**  
**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**  
**CURRICULA AND SYLLABI FOR SEMESTER I & II**  
**SEMESTER – I**

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	IP3151	Induction Programme	-	-	-	-	-	0
<b>THEORY</b>								
2.	HS3151	Professional English - I	HSMC	3	1	0	4	4
3.	MA3151	Matrices and Calculus	BSC	3	1	0	4	4
4.	PH3151	Engineering Physics	BSC	3	0	0	3	3
5.	CY3151	Engineering Chemistry	BSC	3	0	0	3	3
6.	GE3151	Problem Solving and Python Programming	ESC	3	0	0	3	3
<b>PRACTICALS</b>								
7.	GE3171	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
8.	BS3171	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
<b>TOTAL</b>				<b>15</b>	<b>2</b>	<b>8</b>	<b>25</b>	<b>21</b>

**SEMESTER – II**

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1.	HS3251	Professional English - II	HSMC	3	1	0	4	4
2.	MA3251	Statistics and Numerical Methods	BSC	3	1	0	4	4
3.	PH3202	Physics for Electrical Engineering	BSC	3	0	0	3	3
4.	BE3255	Basic Civil and Mechanical Engineering	ESC	3	0	0	3	3
5.	GE3251	Engineering Graphics	ESC	2	0	4	6	4
6.	EE3251	Electric Circuit Analysis	PCC	3	1	0	4	4
7.		NCC Credit Course Level1*	-	2	0	0	2	2
<b>PRACTICALS</b>								
8.	GE3271	Engineering Practices Laboratory	ESC	0	0	4	4	2
9.	EE3271	Electric Circuits Laboratory	PCC	0	0	4	4	2
<b>TOTAL</b>				<b>17</b>	<b>3</b>	<b>12</b>	<b>32</b>	<b>26</b>

\*NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

**OUTCOMES :**

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles
- To quantitatively analyse the impurities in solution by electroanalytical techniques

**TEXT BOOKS :**

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

**HS3251****PROFESSIONAL ENGLISH - II****L T P C  
3 1 0 4****OBJECTIVES :**

- To engage learners in meaningful language activities to improve their LSRW skills
- To enhance learners' awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

**UNIT I MAKING COMPARISONS****12**

Listening – Evaluative Listening: Advertisements, Product Descriptions, -Audio / video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison)

Speaking – Marketing a product, Persuasive Speech Techniques.

Reading - Reading advertisements, user manuals, brochures;

Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases

Vocabulary – Contextual meaning of words

**UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING****12**

Listening - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects -

Speaking – Describing and discussing the reasons of accidents or disasters based on news reports.

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints.

Grammar - Active Passive Voice transformations, Infinitive and Gerunds Vocabulary – Word Formation (Noun-Verb-Adj-Adv), Adverbs.

**UNIT III PROBLEM SOLVING****12**

Listening – Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions.

Speaking – Group Discussion(based on case studies), - techniques and Strategies,

Reading - Case Studies, excerpts from literary texts, news reports etc.,

Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay

Grammar – Errorcorrection; If conditional sentences

Vocabulary - Compound Words, Sentence Completion.

**UNIT IV REPORTING OF EVENTS AND RESEARCH****12**

Listening – Listening Comprehension based on news reports – and documentaries – Precise writing, Summarising, Speaking –Interviewing, Presenting an oral report, Mini presentations on select topics;

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

**UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY****12**

Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance);

Speaking – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids;

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses Vocabulary – Idioms.

**TOTAL : 60 PERIODS****OUTCOMES:**

At the end of the course, learners will be able

- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts
- To analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes in context of job search.

**TEXT BOOKS :**

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERENCES:**

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

**OBJECTIVES:**

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

**UNIT I TESTING OF HYPOTHESIS****9 + 3**

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

**UNIT II DESIGN OF EXPERIMENTS****9 + 3**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design -  $2^2$  factorial design.

**UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS****9 + 3**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION****9 + 3**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

**UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS****9 + 3**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

**TOTAL: 60 PERIODS****OUTCOMES:**

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

- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.

- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

**TEXT BOOKS:**

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10<sup>th</sup> Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8<sup>th</sup> Edition, 2015.

**REFERENCES:**

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9<sup>th</sup> Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7<sup>th</sup> Edition, 2007.
4. Gupta S.C. and Kapoor V. K., " Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12<sup>th</sup> Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4<sup>th</sup> Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9<sup>th</sup> Edition, Pearson Education, Asia, 2010.

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PROGRESS THROUGH KNOWLEDGE

**OBJECTIVES :**

- To make the students to understand the basics of dielectric materials and insulation.
- To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

**UNIT I DIELECTRIC MATERIALS AND INSULATION 9**

Matter polarization and relative permittivity: definition – dipole moment and polarization vector P- polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization – frequency dependence – local field and Clausius-Mossetti equation – dielectric constant and dielectric loss – Gauss's law and boundary conditions – dielectric strength, introduction to insulation breakdown in gases, liquids and solids – capacitor materials – typical capacitor constructions – piezoelectricity, ferroelectricity and pyroelectricity – quartz oscillators and filters – piezo and pyroelectric crystals.

**UNIT II ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS 9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Quantum free electron theory :Tunneling – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole. Magnetic materials: Dia, para and ferromagnetic effects – paramagnetism in the conduction electrons in metals – exchange interaction and ferromagnetism – quantum interference devices – GMR devices.

**UNIT III SEMICONDUCTORS AND TRANSPORT PHYSICS 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 – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

**UNIT IV OPTICAL PROPERTIES OF MATERIALS 9**

Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode – laser diode - optical processes in organic semiconductor devices –excitonic state – Electro-optics and nonlinear optics: Modulators and switching devices – plasmonics.

**UNIT V NANO DEVICES 9**

Density of states for solids - Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots – Band gap of nanomaterials –Tunneling – Single electron phenomena – Single electron Transistor. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance –

Carbon nanotubes: Properties and applications - Spintronic devices and applications – Optics in quantum structures – quantum well laser.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course, the students should be able to

- know basics of dielectric materials and insulation.
- gain knowledge on the electrical and magnetic properties of materials and their applications
- understand clearly of semiconductor physics and functioning of semiconductor devices
- understand the optical properties of materials and working principles of various optical devices
- appreciate the importance of nanotechnology and nanodevices.

**TEXT BOOKS:**

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.

**REFERENCES:**

- 1 .Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
5. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

**BE3255**

**BASIC CIVIL AND MECHANICAL ENGINEERING**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

**UNIT I PART A: OVERVIEW OF CIVIL ENGINEERING**

**5**

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water

Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

**UNIT I PART B: OVERVIEW OF MECHANICAL ENGINEERING 4**

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

**UNIT II SURVEYING AND CIVIL ENGINEERING MATERIALS 9**

**Surveying:** Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours.

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber - Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only)

**UNIT III BUILDING COMPONENTS AND INFRASTRUCTURE 9**

Building plans – Setting out of a Building - Foundations: Types of foundations - Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering.

Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

**UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 9**

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices

**UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 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. Properties of air - water mixture, concepts of psychometric and its process.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- CO1: Understanding profession of Civil and Mechanical engineering.
- CO2: Summarise the planning of building, infrastructure and working of Machineries.
- CO3: Apply the knowledge gained in respective discipline
- CO4: Illustrate the ideas of Civil and Mechanical Engineering applications.
- CO5: Appraise the material, Structures, machines and energy.

**TEXT BOOKS:**

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018



**REFERENCES:**

- 1.Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
- 2.Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
- 3.Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
- 4.Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.

**GE3251****ENGINEERING GRAPHICS****L T P C  
2 0 4 4****OBJECTIVES:**

The main learning objective of this course is to prepare the students for:

1. Drawing engineering curves.
2. Drawing freehand sketch of simple objects.
3. Drawing orthographic projection of solids and section of solids.
4. Drawing development of solids
5. Drawing isometric and perspective projections of simple solids.

**CONCEPTS AND CONVENTIONS (Not for Examination)**

Importance of graphics in engineering applications — Use of drafting instruments — BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

**UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.

Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 +12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.

Practicing three dimensional modeling of simple objects by CAD Software(Not for examination)

## UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS

6+12

Principles of isometric projection — isometric scale — Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Practicing three dimensional modeling of isometric projection of simple objects by CAD Software(Not for examination)

**TOTAL: (L=30+P=60) 90 PERIODS**

### OUTCOMES:

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

- Use BIS conventions and specifications for engineering drawing.
- Construct the conic curves, involutes and cycloid.
- Solve practical problems involving projection of lines.
- Draw the orthographic, isometric and perspective projections of simple solids.
- Draw the development of simple solids.

### TEXT BOOK:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53<sup>rd</sup> Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

### REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2<sup>nd</sup> Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27<sup>th</sup> Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2<sup>nd</sup> Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

### Publication of Bureau of Indian Standards:

1. IS 10711 —2001: Technical products Documentation — Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

### Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

**OBJECTIVES:**

- To introduce electric circuits and its analysis
- To provide key concepts to analyze and understand electrical circuits
- To impart knowledge on solving circuit equations using network theorems
- To educate on obtaining the transient response of circuits.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of single & three phase circuits

**UNIT I BASIC CIRCUITS ANALYSIS****9+3**

Fundamentals concepts of R, L and C elements-Energy Sources- Ohm's Law -Kirchhoff 's Laws – DC Circuits – Resistors in series and parallel circuits - A.C Circuits – Average and RMS Value – Complex Impedance – Phasor diagram - Real and Reactive Power, Power Factor, Energy -Mesh current and node voltage methods of analysis D.C and A.C Circuits.

**UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS****9+3**

Network reduction: voltage and current division, source transformation – star delta conversion. Theorems – Superposition, Thevenin's and Norton's Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem- Tellegen's Theorem-Statement, application to DC and AC Circuits.

**UNIT III TRANSIENT RESPONSE ANALYSIS****9+3**

Introduction – Laplace transforms and inverse Laplace transforms- standard test signals -Transient response of RL, RC and RLC circuits using Laplace transform for Source free, Step input and Sinusoidal input.

**UNIT IV RESONANCE AND COUPLED CIRCUITS****9+3**

Series and parallel resonance –frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Dot rule-Analysis of coupled circuits– Single Tuned circuits..

**UNIT V THREE PHASE CIRCUITS****9+3**

Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced – phasor diagram of voltages and currents – power measurement in three phase circuits– Power Factor Calculations.

**TOTAL: 60 PERIODS****OUTCOMES:**

After completing this course, the students will be able to:

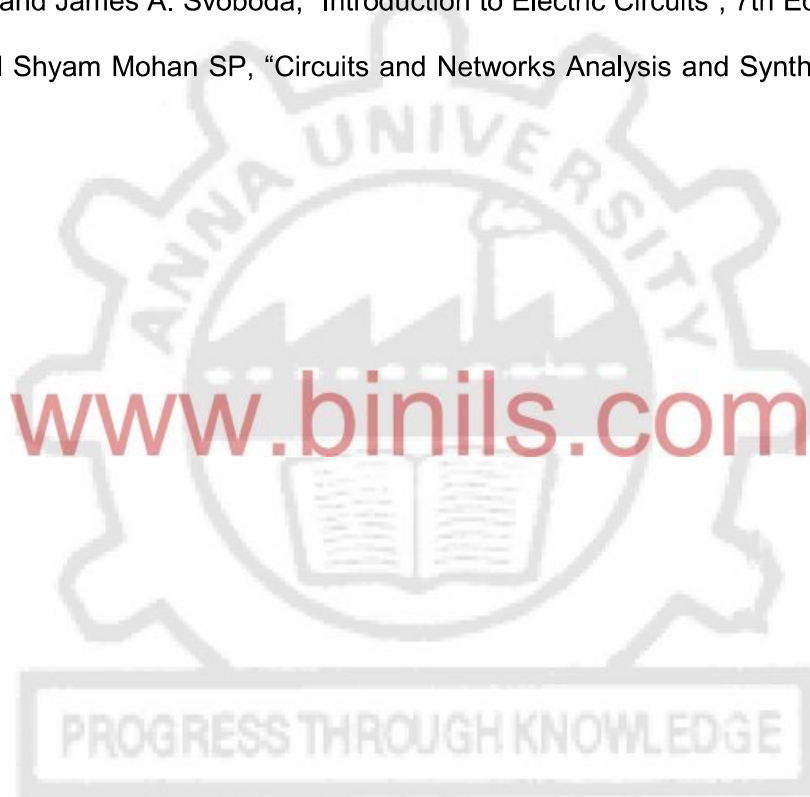
- CO1: Explain circuit's behavior using circuit laws.
- CO2: Apply mesh analysis/ nodal analysis / network theorems to determine behavior of the given DC and AC circuit
- CO3: Compute the transient response of first order and second order systems to step and sinusoidal input
- CO4: Compute power, line/ phase voltage and currents of the given three phase circuit
- CO5: Explain the frequency response of series and parallel RLC circuits
- CO6: Explain the behavior of magnetically coupled circuits.

**TEXT BOOKS:**

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9<sup>th</sup> edition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

**REFERENCES**

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai & Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
4. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2018.
6. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraw Hill, 2015.



**NCC Credit Course Level 1\***

<b>NX3251</b>		<b>(ARMY WING) NCC Credit Course Level - I</b>			<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
				<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	
<b>NCC GENERAL</b>								<b>6</b>
NCC 1	Aims, Objectives & Organization of NCC						1	
NCC 2	Incentives						2	
NCC 3	Duties of NCC Cadet						1	
NCC 4	NCC Camps: Types & Conduct						2	
<b>NATIONAL INTEGRATION AND AWARENESS</b>								<b>4</b>
NI 1	National Integration: Importance & Necessity						1	
NI 2	Factors Affecting National Integration						1	
NI 3	Unity in Diversity & Role of NCC in Nation Building						1	
NI 4	Threats to National Security						1	
<b>PERSONALITY DEVELOPMENT</b>								<b>7</b>
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving						2	
PD 2	Communication Skills						3	
PD 3	Group Discussion: Stress & Emotions						2	
<b>LEADERSHIP</b>								<b>5</b>
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code						3	
L 2	Case Studies: Shivaji, Jhasi Ki Rani						2	
<b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</b>								<b>8</b>
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth						3	
SS 4	Protection of Children and Women Safety						1	
SS 5	Road / Rail Travel Safety						1	
SS 6	New Initiatives						2	
SS 7	Cyber and Mobile Security Awareness						1	

**TOTAL : 30 PERIODS**

### NCC Credit Course Level 1\*

<b>NX3252</b>	<b>(NAVAL WING) NCC Credit Course Level - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>NCC GENERAL</b>					<b>6</b>
NCC 1	Aims, Objectives & Organization of NCC				1
NCC 2	Incentives				2
NCC 3	Duties of NCC Cadet				1
NCC 4	NCC Camps: Types & Conduct				2
<b>NATIONAL INTEGRATION AND AWARENESS</b>					<b>4</b>
NI 1	National Integration: Importance & Necessity				1
NI 2	Factors Affecting National Integration				1
NI 3	Unity in Diversity & Role of NCC in Nation Building				1
NI 4	Threats to National Security				1
<b>PERSONALITY DEVELOPMENT</b>					<b>7</b>
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving				2
PD 2	Communication Skills				3
PD 3	Group Discussion: Stress & Emotions				2
<b>LEADERSHIP</b>					<b>5</b>
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code				3
L 2	Case Studies: Shivaji, Jhasi Ki Rani				2
<b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</b>					<b>8</b>
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth				3
SS 4	Protection of Children and Women Safety				1
SS 5	Road / Rail Travel Safety				1
SS 6	New Initiatives				2
SS 7	Cyber and Mobile Security Awareness				1

**NCC Credit Course Level 1\***

<b>NX3253</b>	<b>(AIR FORCE WING) NCC Credit Course Level - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>NCC GENERAL</b>					<b>6</b>
NCC 1	Aims, Objectives & Organization of NCC				1
NCC 2	Incentives				2
NCC 3	Duties of NCC Cadet				1
NCC 4	NCC Camps: Types & Conduct				2
<b>NATIONAL INTEGRATION AND AWARENESS</b>					<b>4</b>
NI 1	National Integration: Importance & Necessity				1
NI 2	Factors Affecting National Integration				1
NI 3	Unity in Diversity & Role of NCC in Nation Building				1
NI 4	Threats to National Security				1
<b>PERSONALITY DEVELOPMENT</b>					<b>7</b>
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving				2
PD 2	Communication Skills				3
PD 3	Group Discussion: Stress & Emotions				2
<b>LEADERSHIP</b>					<b>5</b>
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code				3
L 2	Case Studies: Shivaji, Jhasi Ki Rani				2
<b>SOCIAL SERVICE AND COMMUNITY DEVELOPMENT</b>					<b>8</b>
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth				3
SS 4	Protection of Children and Women Safety				1
SS 5	Road / Rail Travel Safety				1
SS 6	New Initiatives				2
SS 7	Cyber and Mobile Security Awareness				1
					<b>TOTAL : 30 PERIODS</b>

**OBJECTIVES:**

The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

**GROUP – A (CIVIL & ELECTRICAL)****PART I CIVIL ENGINEERING PRACTICES 15****PLUMBING WORK:**

- a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- b) Preparing plumbing line sketches.
- c) Laying pipe connection to the suction side of a pump
- d) Laying pipe connection to the delivery side of a pump.
- e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

- a) Sawing,
- b) Planing and
- c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

**Wood Work Study:**

- a) Studying joints in door panels and wooden furniture
- b) Studying common industrial trusses using models.

**PART II ELECTRICAL ENGINEERING PRACTICES 15**

- a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
- b) Staircase wiring
- c) Fluorescent Lamp wiring with introduction to CFL and LED types.
- d) Energy meter wiring and related calculations/ calibration
- e) Study of Iron Box wiring and assembly
- f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
- g) Study of emergency lamp wiring/Water heater



**GROUP – B (MECHANICAL AND ELECTRONICS)**

**PART III MECHANICAL ENGINEERING PRACTICES**

**15**

**WELDING WORK:**

- a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- b) Practicing gas welding.

**BASIC MACHINING WORK:**

- a) (simple)Turning.
- b) (simple)Drilling.
- c) (simple)Tapping.

**ASSEMBLY WORK:**

- a) Assembling a centrifugal pump.
- b) Assembling a household mixer.
- c) Assembling an airconditioner.

**SHEET METAL WORK:**

- a) Making of a square tray

**FOUNDRY WORK:**

- a) Demonstrating basic foundry operations.

**PART IV ELECTRONIC ENGINEERING PRACTICES**

**15**

**SOLDERING WORK:**

- a) Soldering simple electronic circuits and checking continuity.

**ELECTRONIC ASSEMBLY AND TESTING WORK:**

- a) Assembling and testing electronic components on a small PCB.

**ELECTRONIC EQUIPMENT STUDY:**

- a) Study an elements of smart phone.
- b) Assembly and dismantle of LED TV.
- c) Assembly and dismantle of computer/ laptop

**TOTAL : 60 PERIODS**

**OUTCOMES:**

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

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

**OBJECTIVES:**

- To simulate various electric circuits using Pspice/ Matlab/e-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems

**LIST OF EXPERIMENTS****Familiarization of various electrical components, sources and measuring instruments**

1. Simulation and experimental verification of series and parallel electrical circuit using fundamental laws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transfer theorem.
6. Simulation and Experimental validation of R-C,R-L and RLC electric circuit transients
7. Simulation and Experimental validation of frequency response of RLC electric circuit.
8. Design and implementation of series and parallel resonance circuit.
9. Simulation and experimental verification of three phase balanced and unbalanced star, delta networks circuit (Power and Power factor calculations).

**TOTAL: 60 PERIODS****OUTCOMES:**

- Use simulation and experimental methods to verify the fundamental electrical laws for the given DC/AC circuit (Ex 1)
- Use simulation and experimental methods to verify the various electrical theorems (Superposition, Thevenin, Norton and maximum power transfer) for the given DC/AC circuit (Ex 2-5)
- Analyze transient behavior of the given RL/RC/RLC circuit using simulation and experimental methods (Ex 6)
- Analyze frequency response of the given series and parallel RLC circuit using simulation and experimentation methods (Ex 7-8)
- Analyze the performance of the given three-phase circuit using simulation and experimental methods (Ex 9)