Established: 1999

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

(An Empowered Autonomous Institute)

ADCET

F.Y. B. Tech. – Electronics and Telecommunication Engineering
[Level 4.5, UG Certificate] Semester -I

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	0ETBS101	Engineering Mathematics -I	3	1	-	4	4	40	20	40	-	-
02	BS	LIT2	0ETBS102	Engineering Chemistry	3	-	2	3	4	40	20	40	50	-
03	ES	T1	0ETES103	Introduction of Emerging Technologies	2	-	-	2	2	40	20	40	-	-
04	ES	LIT1	0ETES104	Basic Electrical Engineering	3	-	2	3	4	40	20	40	50	50
05	ES	L2	0ETES105	Biology for Engineers	1	-	2	1	2	-	-	-	50	-
06	HS/IKS	L2	0ETHS106	Communication Skills	-	-	4	-	2	-	-	-	50	-
07	VS/PC	L2	0ETVS107	IDEA Lab Workshop	1	-	2	1	2	-	-	-	50	-
08	CC	L2	*0ETCCXXX	Liberal Learning Course – I	-	-	2	-	1	-	-	-	50	-
				Total	**13**	**1**	**14**	**14**	**21**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE (Theory): ≥32/80	TA (Theory) / CIE (Lab) : ≥20/50	ESE (Lab) : ≥20/50

CC Bouquet ; * - Common Course floated at institute level.

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC126 - Cultural Exploration & Heritage	3BSCC131 - Introduction to Dance and Movement
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC127 – Leadership and Team Management	3BSCC132 - Introduction to Music and Singing
3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC128 – Self Management and Purposeful Living	3BSCC133 - Happiness and Well-Being
3BSCC124 - Creativity through Visual Arts	3BSCC129 – Business Communication	3BSCC134 - Financial Literacy and Investment Awareness
3BSCC125 - Community Engagement through NSS	3BSCC130 - Mathematical Reasoning	3BSCC135 – Cyber Awareness and Ethics

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F.Y. B. Tech. – Electronics and Telecommunication Engineering

[Level 4.5, UG Certificate] Semester -II

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	0ETBS108	Engineering Mathematics -II	3	1	-	4	4	40	20	40	-	-
02	BS	LIT2	0ETBS109	Engineering Physics	3	-	2	3	4	40	20	40	50	-
03	ES	LIT2	0ETES110	Engineering Graphics	3	-	2	3	4	40	20	40	50	-
04	ES	L1	0ETES111	Programming for problem solving	2	-	2	2	3	-	-	-	50	50
05	ES	L2	0ETES112	Design Thinking Lab	-	-	2	-	1	-	-	-	50	-
06	PC/VS	LIT1	0ETPC113	Analog & Digital Electronics	3	-	2	3	4	40	20	40	50	50
07	IKS/ HS	T2	0ETIKS114	Indian Knowledge System	2	-	-	2	2	-	50	-	-	-
08	CC	L2	*0ETCCXXX	Liberal Learning Course - II	-	-	2	-	1	-	-	-	50	-
				Total	**16**	**1**	**12**	**17**	**23**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE(Theory): ≥32/80	TA (Theory) / CIE (Lab) : ≥20/50	ESE (Lab) : ≥20/50

CC Bouquet : * - Common Course floated at institute level.

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC126 - Cultural Exploration & Heritage	3BSCC131 - Introduction to Dance and Movement
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC127 – Leadership and Team Management	3BSCC132 - Introduction to Music and Singing
3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC128 – Self Management and Purposeful Living	3BSCC133 - Happiness and Well-Being
3BSCC124 - Creativity through Visual Arts	3BSCC129 – Business Communication	3BSCC134 - Financial Literacy and Investment Awareness
3BSCC125 - Community Engagement through NSS	3BSCC130 - Mathematical Reasoning	3BSCC135 – Cyber Awareness and Ethics

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Exit after **F.Y. B. Tech. – Electronics and Telecommunication Engineering**

i Students will have the option to exit the Engineering program after successfully completing the first year. Upon exit, they will be awarded an Undergraduate Certificate.

ii To be eligible for this exit option, students must also earn an additional 10 credits through any one of the following pathways:

iii Skill-Based Subject: A course focused on developing industry-relevant technical or professional skills.

iv Work-Based Vocational Course: Hands-on vocational training in an engineering-related domain, typically offered during the summer term.

v Internship/Apprenticeship: A minimum 8-week internship or apprenticeship in a relevant engineering domain to gain real-world experience.

vi Social Responsibility & Community Engagement: A community-based project in collaboration with an NGO or similar organization, applying engineering knowledge for social impact.

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**0ETBS101, Engineering Mathematics-I**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	1	-	4	4		

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Determine the consistency of systems of linear equations using Echelon form of matrix
CO2	Compute Eigen values, Eigen vectors, powers and inverse of a square matrix using characteristic equation
CO3	Apply the concepts of complex number to solve the equations using De Moivre's theorem and hyperbolic identities
CO4	Calculate partial derivatives, Jacobians and extreme values of function of two variables using concept of partial differentiation
CO5	Solve ordinary differential equation of order one and degree one using analytical method and numerical techniques.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Solution of System of Linear Equations:** Definition of system of linear equations, Classification of system of linear equations, Rank of matrix: Concept and computation using Echelon form and Normal form, Rouché–Capelli Theorem (Statements only), Solution of non-homogeneous system of linear equations, solution of Homogeneous system of linear equations, applications to electrical circuit analysis (mesh and nodal analysis), communication networks, and signal processing problems	**7**
II	***Eigen Values and Eigen Vectors:*** *Definition of vectors in* R^n, *Linear Dependence and* Independence of Vectors, Characteristic Equation of Matrix, Cayley-Hamilton theorem (statement only), Applications of Cayley-Hamilton theorem, Eigen Values and Properties, Eigen Vectors and Properties.	**7**
III	**Complex Number:** Definition of complex number, Polar and exponential form of complex number, De Moivre's Theorem and Simple Applications, Power and Roots of complex numbers, Applications in solving equations. **Hyperbolic Functions:** Definitions, Identities of hyperbolic functions, Relation between Circular functions and hyperbolic functions, Inverse hyperbolic functions.	**8**
IV	**Partial Differentiation and Applications:** Functions of several variables, partial derivatives of first order, Higher order partial derivatives, Homogeneous functions, Euler's Theorem on homogeneous function: statement and verification, Jacobians and Properties, Maxima and minima of functions of two variables.	**8**
V	**Ordinary Differential Equation of first order and first degree:** Exact differential equation, reducible to exact differential equation, Linear differential equation, reducible to linear differential equation, Applications to RC Filter, Automatic Gain Control (AGC) circuits.	**8**
VI	**Numerical Solution of Ordinary differential equation of First Order & First Degree:** Euler's method, Modified Euler's method, Runge–Kutta third order, Runge-Kutta Method of order four, Taylor Series method.	**7**
	Total Lecture Hours	**45**

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List of Tutorial with CO Mapping

Sr.No	Title of Tutorial	CO Mapped
1	Rank of matrix and Solution of Homogeneous System of Linear Equations	1
2	Solution of Non-Homogeneous System of Linear Equations	1
3	Eigen Value, Eigen vectors and Properties	2
4	Cayley-Hamilton theorem and Applications	2
5	De Moivre's Theorem, Applications and Hyperbolic functions	3
6	Partial differentiations and Euler's theorem	4
7	Jacobians and Maxima-Minima of Two Variable Functions	4
8	Euler's and Modified Euler's Methods for Solving Initial Value Problems	5
9	Runge-Kutta Methods and Taylor series method	5
10	Ordinary differential equations of first order and first degree	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das , Advanced Engineering Mathematics , 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. *Dr. B. S. Grewal , Numerical Methods , 9th Edition, Khanna Publishers ., 2010*

References:

1. Dr. B. S. Grewal , Higher Engineering Mathematics , 44th Edition, Khanna Publishers ,2018.
2. N. P. Bali, Manish Goyal , Advanced Engineering Mathematics , 7th Edition, Infinity science press ,2010
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi Griha Prakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.

Online Learning Resources

1. NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur *https://nptel.ac.in/courses/111105121*
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta , Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course on Mathematics-III, by Prof. Durga C Dalal, Dr. M. Guru Prem Prasad, IIT Guwahati https://nptel.ac.in/courses/122103012

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Course Information:

Class, Semester	F Y. B.Tech, Semester - I					**Category**	**BS**
Course Code, Course Title	**0ETBS102, Engineering Chemistry**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	1	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) :

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

CO1	Explain the properties and applications of engineering materials for industrial and societal use based on their chemical compositions.
CO2	Discuss methods for preventing corrosion in metals by relating them to corrosion types and environmental conditions using basic chemical principles.
CO3	Solve the domestic and industrial problems related to water quality parameters using theoretical knowledge and laboratory experiments.
CO4	Apply the principles of analytical instruments in the analysis of samples with help of foundational practical *chemistry knowledge.*
CO5	Compute the calorific values of fuels for domestic and industrial applications using standard fundamental chemical equations.

Syllabus:

Module	Contents	Lecture Hours
I	**Water Technology and Management:** Introduction, impurities in natural water and it's removal, **Water Testing:** Acidity, alkalinity, chlorides and hardness of water (definition, causes and significance), WHO Standards, Scales and sludges: Formation in boilers and removal, Disinfection of water. **Treatment of hard water by:** Ion- exchange process, Zeolite process, Reverse Osmosis, Numericals on temporary, permanent and total hardness of water.	8
II	***Chemical and Analytical Techniques:*** Introduction, Chemical analysis and it's types. A) **pH-metry:** Introduction, pH measurement using glass electrode and it's applications. B) **Spectrometry**: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's laws), Instrumentation and applications of UV-Visible spectrophotometer. C) **Chromatography**: Introduction, principle, instrumentation and applications of Thin- Layer chromatography (TLC) and Gas-Liquid chromatography (GLC).	8
III	**Advanced Materials for Electronic Engineers:** A) **Polymers**: Introduction, Plastics: Thermo-softening and thermosetting plastics, industrially important plastics like PVC, PTFE (Teflon), urea-formaldehyde, Conducting polymers, it's classification and applications, Biodegradable plastics. B) **Composites:** Introduction, Constituents, Fibre-reinforced plastics (FRP) and Glass-reinforced plastics (GRP).	7
IV	**Battery Technology and Fuels:** A) **Batteries:** Introduction, Types of batteries, battery characteristics, Lithium -ion batteries (LIBs), Sodium- ion batteries (SIBs) (Instrumentation, advantages, disadvantages and applications). B) **Fuels:** Introduction, classification, characteristics of good fuels, Types of calorific value (higher and lower), Bomb and Boy's calorimeters, Numerical on GCV and NCV, Fuel cells, Introduction to solar cells.	8
V	**Corrosion & it's Prevention:** **Corrosion:** Introduction, causes, types of corrosion, Electrochemical corrosion (hydrogen evolution and oxygen absorption mechanisms), Factors affecting rate of corrosion.	7

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	Prevention of Corrosion: Introduction, Hot dipping (Galvanizing and tinning), Electroplating process, Cathodic protection methods, Metal cladding, Protection by material selection and designing.	
VI	**Metallic Materials and Green Chemistry:** Introduction, classification of engineering materials. **Alloys:** Types of alloys, purposes of making alloys, Ferrous alloys: Plain carbon steels (mild, medium and high). Nonferrous alloys: Aluminum alloy (Duralumin and Alnico), Nickel alloy (Nichrome), Tin alloys (Solders). **Green Chemistry:** Definition, Twelve principles of green chemistry, Research and industrial applications, Green house effect and it's remedies.	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	COs Mapped
1	Determination of acidity of water sample (Neutralization Titration).	3
2	Determination of alkalinity of water sample (Acid- Base Titration).	3
3	Determination of chloride content of water by Mohr's method. (Precipitation Titration).	3
4	Determination of total hardness of water sample by EDTA method.	3
5	*Preparation of Urea-formaldehyde resin (Condensation Polymerization).*	*1*
6	Preparation of Phenol-formaldehyde resin (Condensation Polymerization).	1
7	Determination of rate of corrosion of Aluminium in acidic and basic medium (Weight loss method).	2
8	Estimation of copper in brass solution (Displacement Titration).	1
9	Estimation of zinc in brass solution (Displacement Titration).	1
10	Determination of pH of industrial waste water by using pH meter.	4
11	Determination of strength of acid/base by using conductivity meter.	4
12	Demonstration of bomb calorimeter to calculate calorific value of fuels.	5
13	Demonstration of Photo-colorimeter.	4
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books:

1. S. S. Dara, A Text Book of Engineering Chemistry, *11th* Edition, S. Chand & Co. New Delhi, *2008.*
2. Shashi Chawala, A Text book of Engineering Chemistry 3rd Edition, Dhanpat Rai Publishing Co. New Delhi, 2007
3. Ziyauddin D. Sande, Vijayalaxmi M. Vairat, Pratapsingh V. Gaikwad, A Text book of Applied Chemistry, 1st Edition, Wiley Publications, 2018

References:

1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Co., New Delhi., 2015.
2. Wiley India, Engineering Chemistry, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, 5th Edition, Himalaya Publishing House, Mumbai, 2005.
4. B. K. Sharma, Industrial Chemistry, 10th Edition, Goel publication (P) Ltd., 1999
5. S. K. Singh, Fundamentals of Engineering Chemistry, 1st , New Age International (P) Ltd, New Delhi, 2009

Online Learning Resources:

1. *Water Technology-- https://youtu.be/dKWJzp_rrlE*
2. For lithium-ion batteries (LIBs): https://www.youtube.com/watch?v=DBLHaLhyo2w
3. Wikipedia - Composite materials: https://en.wikipedia.org/wiki/Composite_material

Experiments that may be performed through virtual labs:

Sr. No.	Experiment Name	Experiments Links
1.	Water analysis-Determination of Chemical parameters	https://inoc-amrt.vlabs.ac.in/exp/water-analysis-chemical-parameters/index.html
2.	Demonstration of Photo-colorimeter	https://pcv-amrt.vlabs.ac.in/exp/spectrophotometry/index.html

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Course Information:

Class, Semester	F.Y. B.Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**0ETES103, Introduction to Emerging Technologies**					**Type**	**T1**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	2	-	-	1	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		--	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Describe the key characteristics of emerging technologies such as AI, IoT, AR/VR, Quantum Computing, and Blockchain
CO2	Apply the concepts of AI, IoT, CPS, and Blockchain to real-world case studies to identify their disruptive impact on digital transformation initiatives
CO3	Explain the role of robotics, additive manufacturing, and green technologies in supporting sustainability and ethical technology deployment
CO4	Implement innovative solutions using autonomous systems and green technologies to address sustainability challenges

Syllabus:

Module	Contents	Lecture Hours
I	**Foundations of Emerging Technologies and Innovation Ecosystem** Emerging technologies characteristics and disruptive impact, Indian innovation ecosystem: Digital India, Startup India, AIM, India Stack, National Education Policy and interdisciplinary learning, Case studies: Smart Cities, Aadhaar, UPI, Digital Health Mission.	5
II	**Artificial Intelligence, Machine Learning & Data Science** AI basics: history, goals, types of AI (Narrow, General, Super AI), Machine learning: supervised, unsupervised, reinforcement learning, Introduction to data science: lifecycle, Big Data (5Vs), visualization, Human-centered AI and ethical concerns: bias, privacy, responsible AI.	5
III	**IoT, Cyber-Physical Systems, Edge Computing & Cybersecurity** IoT: architecture, sensors, communication, cloud, Cyber-physical systems: smart grid, autonomous vehicles, industrial automation, Edge & fog computing: real-time applications and use cases, Cybersecurity basics: CIA triad, malware, phishing, digital hygiene.	5
IV	**AR/VR, Quantum Technologies and Blockchain** AR/VR/XR: definitions, tools, applications in gaming, education, healthcare, Metaverse and immersive computing, Introduction to quantum computing: qubits, entanglement, potential impact. Quantum AI. Blockchain, Smart Contracts, DApps, DeFi, NFTs,	5
V	**Robotics, Autonomous Systems & Additive Manufacturing** Robotics: types, sensors, actuators, applications in healthcare, defense, logistics, Autonomous systems: drones, driverless vehicles, swarm robotics, 3D/4D printing: additive manufacturing, materials, future directions, Design thinking for innovation in robotics & manufacturing.	5
VI	**Green Technologies, Sustainability & Tech Ethics** Emerging technologies for solving climate/environmental challenges, Smart grids, clean energy systems, climate tech, e-waste, Sustainable design and SDGs: tech for social good, Tech ethics: inclusivity, equity, digital divide, societal impact.	5
	Total Lecture Hours	**30**

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Course Information:

Class, Semester	F.Y. B.Tech, Semester - I					**Category**	**ES**
Course Code, Course Title	**0ETES104, Basic Electrical Engineering**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	3	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) :

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

CO1	**Solve** DC circuits using fundamental laws to find electrical Parameters
CO2	**Describe** magnetic circuits and compare them with electric circuits.
CO3	**Compute** AC parameters and analyze RLC circuits using phasor diagrams.
CO4	**Explain** star/delta configurations and describe balanced three-phase system operation
CO5	**Use** appropriate protective devices and explain EV battery technologies and charging standards.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of DC Circuits:** Introduction to Basic Electrical Quantities, Ohm's Law and its Limitations, Series and Parallel Circuits, Types Of Electrical Sources, Resistance, Inductance, Capacitance, Energy Stored In Capacitor, Charging and Discharging Of Capacitor, Kirchhoff's Laws.	9
II	**Magnetic Circuits:** Concepts Of Magnetic Circuits, Magnetic Flux, Reluctance, Flux Density, Magneto Motive Force, Magnetic Field Strength, Permeability, Comparison: Magnetic Vs. Electric Circuits, Self-Inductance and Mutual Inductance, Magnetization Curve (B-H Curve) and Hysteresis Loop, Magnetic Leakage and Fringing Effects, Operating Principle Of DC Machine.	7
III	**Fundamentals of Alternating Current:** Advantages Of AC Over DC, Faraday's Laws Of Electromagnetic Induction, Statically and Dynamically Induced Emfs, Flemings Right Hand Rule, Lenz's Law, Generation Of Sinusoidal Voltage, Waveform, Cycle, Frequency, Time Period, Instantaneous Value, RMS Value, Average Value, Form Factor, and Peak Factor, Concept Of Lagging and Leading Phase Difference, Phasor Representation.	7
IV	**Single Phase AC Circuits:** AC Circuit Parameters: R, L, C Circuit Elements, R-L, R-C, R-L-C Series A.C. Circuits- Voltage and Current Waveforms, Vector Diagram, Voltage, Impedance And Power Triangle, Power Factor, RL Parallel and RL-C Parallel Circuit, Series and Parallel Resonance.	8
V	**Three Phase AC Circuits:** Advantages Of Three Phase Circuit Over Single Phase AC Circuits, Generation Of 3-Phase Alternating Emf, Three Phase Waveform, Phase Sequence, Types Of Supply Systems and Load Connections, Relationship Between Line and Phase Quantities, Balanced and Unbalanced System: Star and Delta Connections.	7
VI	**Electrical Protective Devices And Recent Industry Trends:** **Protective Devices:** Personal Protective Equipment, Fuse, Miniature Circuit Breaker, Earth Leakage Circuit Breaker. **Recent Industry Trends**: Introduction to Electric Vehicles (EV), Classification Of Electric Vehicle, Energy Storage System, Types Of Batteries. EV Charging Infrastructure.	7
	Total Lecture Hours	45

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Study of basic electrical components, equipment, their symbols, and safety precautions in electrical engineering.	1
2	Simulation and experimental verification of kirchoff's voltage law.	1

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3	Simulation and experimental verification of kirchoff's current law.	1
4	Demonstration of mutually induced emf by using single-phase transformers.	2
5	Plotting the B-H curve for a magnetic material.	2
6	Measurement of frequency, time period, peak value, and rms value of a sinusoidal ac waveform using CRO	3
7	Determination of voltage, current, and power factor in an R-L series circuit	3
8	Measurement of active, reactive, and apparent power in an R-L-C series circuit	3
9	Connection and testing of three-phase star connected balanced load.	4
10	Connection and testing of three-phase delta connected balanced load.	4
11	Identify different types of fuses and circuit breakers	5
12	Connect MCB in electrical circuit and check its operation at normal and abnormal conditions.	5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering, 4th Tata McGraw Hill, 2022
2. Rajendra Prasad Fundamentals of Electrical Engineering 1st PHI learning pvt ltd, 2005
3. U.A. Bakshi and U. V. Bakshi Basic Electrical Engineering, 1st Technical publication ,2005
4. B.L. Theraja and A. K. TherajaA Textbook of Electrical Technology Vol. 1, S. Chand Publications, 2023

References:

1. A.K. Thereja and B.L. Thereja,Electrical Technology volume II,2nd, S. Chand & Co. Publications,2007.
2. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering, 1st S K Kataria and Sons, 2022
3. V. K. Mehta & Rohit Mehta, Principles of Electrical Engineering and Electronics, 1st S. Chand Publishing, 2019
4. V. K. Mehta & Rohit Mehta, Basic Electrical Engineering, 1st S. Chand Publishing, 2006

Online Learning Resources

1. https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/
2. https://en.wikipedia.org/wiki/Magnetic_circuit
3. https://en.wikipedia.org/wiki/Electric_battery
4. https://bolt.earth/blog/indian-ev-charging-infrastructure-by-2030?srsltid=AfmBOoqB5TqQo6tujqS13-3e4x2iQUqf_KxLkR-zaIo4_qGd2YW0lNr7

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Simulation & Experimental verification of Kirchhoff's law	https://bes-iitr.vlabs.ac.in/exp/kirchhoff-law/simulation.html
2.	Plotting the B-H curve for a magnetic material	https://bop2-iitk.vlabs.ac.in/exp/hysteresis-loss/theory.html

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Course Information:

Class, Semester	FY. B. Tech, Semester - II					**Category**	**ES**
Course Code, Course Title	0ETES105, Biology for Engineers					**Type**	**L2**
Prerequisites	-						
Teaching Scheme	***Lecture***	***Tutorial***	***Practical***	***Self-Study***	***Credits***		
(per week)	1	-	2	1	2		
Examination Scheme	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
(Marks)		-	-	-		50	-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

CO1	Define fundamental biological principles of Cellular structures, Genetics, Biochemistry and apply them in solving practical, real-world problems.
CO2	Explain basic molecular processes, structure and function of DNA with emphasis on replication, transcription, and translation processes relevant to modern engineering practices.
CO3	Describe microbiology and biotechnology concepts to design and implement effective solutions in computational and systems engineering projects.
CO4	Classify how biological systems inspire neural networks and biomimetic designs, drawing upon principles from biomimetics, systems biology, and proteomics
CO5	Compare the environmental and health challenges, along with the ethical, legal, and social implications, of applying biological principles to develop sustainable engineering solutions from a biological perspective.
CO6	Identify diseases and disorders, healthcare technologies, and correlate the role of Artificial Intelligence in developing effective engineering solutions in health care technology.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Biology and Its Relevance for Engineers** Course Overview & Importance of Biology in Engineering: Introduction to interdisciplinary approaches. Cell Theory & Structure: Overview of prokaryotic versus eukaryotic cells, Transport Across Cell Membrane, Cell Division. Interdisciplinary Integration: How biological principles inform cutting-edge engineering designs.	2
II	**Microbiology and Biotechnology** Introduction to Microorganisms: Bacteria, viruses, fungi, and their characteristics. Microbial Genetics & Evolution: Gene transfer, mutations, and their impacts. Techniques in Microbiology: Isolation, culturing methods, and basic staining techniques.	2
III	***Systems Biology and Bioinformatics*** Principles of Systems Biology: Understanding networks, feedback loops, and complex systems, Introduction to Bioinformatics: Tools and techniques for computational biology, Genomics and Proteomics: Overview of genomic data and proteomic analysis.	3
IV	**Genetics and Molecular Engineering** DNA Structure and Function: Detailed exploration of replication, transcription, and translation, Genetic Engineering Techniques: Overview of CRISPR, recombinant DNA, and related methodologies, Ethical, Legal & Social Aspects: Discussion on the implications of genetic modification.	3

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V	**Biomimetics and Neural Networks** Introduction to Biomimetics: Nature-inspired designs in engineering, Anatomy of the Human Brain: Basic neurobiology and the organization of neural systems, From Biology to AI: Understanding how neural networks are modelled after natural systems.	2
VI	**Diseases, Health, and Sustainable Engineering** Diseases and Disorders: Infectious, Chronic, Cancer, Genetic and Neurological, Cardiovascular, Auto immune and Role of CSE and IOT, Engineering Solutions in Health: How biological insights contribute to healthcare technologies, Course Integration & Future Directions: Discussion on emerging interdisciplinary trends in CSE and IoT.	3
	Total Lecture Hours	15

List of Experiments with CO Mapping (Minimum 8-10 experiments based on the syllabus)

Sr. No	Title / Topic of the Experiment	CO Mapped
1	Study of simple, compound Microscope	CO1
2	Study of nervous system using specimen, models, etc.	CO4
3	Investigating the Effect of Light on Seed Germination	CO1
4	DNA Extraction from Strawberries	CO2
5	Mendelian Genetics Simulation Using Paper-Based Punnett Squares	CO1
6	Creating Lotus Leaf-Inspired Hydrophobic Surfaces	CO4
7	Building a Physical Model of an Artificial Neural Network	CO4
8	Demonstration of Antibiotic Effects on Bacterial Lawn Culture	CO3
9	Constructing a Simple Particulate Matter Sensor	CO5
10	Simple DNA Extraction from a Banana	CO2
11	Decomposition and Nutrient Recycling Simulation	CO5
12	Virtual Simulation of PCR (Polymerase Chain Reaction)	CO2
13	Analyzing Insect Eye Structures to Improve Camera Algorithms	CO4
14	Comparing Tree Branching Patterns with Neural Network Architectures	CO4
15	Designing a Simple pH Biosensor for Water Analysis	CO5
16	Observation of plant cell and Human Cheek Cells	CO1

Text Books

1. Biology for Engineers, Anthony J. Young, Engineering Press, 1st, 2015
2. Fundamentals of Biology, Lisa M. Johnson, Academic Publishers, 3rd, 2012
3. Essential Cell Biology, Bruce Alberts et al. Garland Science 2nd ,2014
4. Microbiology: An Introduction, Gerard J. Tortora, Pearson, 11th 2017
5. Genetics: From Genes to Genomes, Leland H. Hartwell, McGraw-Hill, 4th, 2011

References:

1. Biotechnology for Engineering, Kavita Kumar, Tech Books Publishing, 2nd, 2018
2. Systems Biology: A Textbook, Edda Klipp, Wiley-VCH, 2nd, 2016
3. Introduction to Bioinformatics, Arthur M. Lesk, Oxford University Press, 2nd, 2013
4. Biomimetics in Engineering, Robert J. Fuller, Springer, 1st, 2019
5. Sustainable Engineering: Principles and Practice, Michael T. Solomon, CRC Press, 3rd, 2020

Online Learning Resources

1. **https://onlinecourses.nptel.ac.in/noc19_ge31**

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Department of Electronics and Telecommunication Engineering

Course Information:

Class, Semester	FY. B.Tech, Semester - I	**Category**	**HS**
Course Code, Course Title	0ETHS106 Communication Skills	**Type**	**L2**
Prerequisites	12th Standard English Grammar		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	---	---	4	---	2

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		---	---	---		50	-

Course Outcomes (COs) :

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

CO1	**Demonstrate** the Listening, Speaking, Reading and Writing (LSRW) skills considering the frame of English language rules accurately for effective and sound communication in academic and profession contexts.
CO2	**Exhibit** their portfolio and career choices confidently, considering corporate expectations by using digital tools convincingly.
CO3	**Write** letters, reports, Emails and Blogs proficiently by following required techniques that help in getting acquainted with professional correspondence.
CO4	**Attain** professional skill while convincingly presenting on allotted topics using MS PowerPoint and AI techniques.
CO5	**Justify** own role in communicative events in well-organized manner with balanced zeal.

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	CO1
2	SWOT Analysis	CO1
3	Basics of English Pronunciation-I	CO1
4	Basics of English Pronunciation-II	CO1
5	Rapid Review of Grammar-I	CO1
6	Rapid Review of Grammar-II	CO1
7	Diagnosing Listening and Speaking Skills	CO1
8	Diagnosing Reading and Writing Skills	CO1
9	Introduction to MS Office (Word, Excel, PPT)	CO1,CO4
10	Presenting my career choices-I	CO1,CO2
11	Presenting my career choices-II	CO1,CO2
12	Preparing Portfolio	CO1,CO2
13	Describing Technical Charts, Image, and Processes	CO1,CO4
14	Using Language Learning Apps and Tools	CO1,CO4
15	Presenting Portfolio	CO1,CO2
16	Effective Presentation Skills	CO1,CO4
17	Delivering Power Point Presentation	CO1,CO4,CO5
18	Job Application and Resume Writing	CO1,CO3
19	Email Writing	CO1,CO3
20	Group Discussion-I	CO1,CO5
21	Group Discussion-II	CO1,CO5
22	Public Speaking -I	CO1,CO5
23	Public Speaking -II	CO1,CO5
24	Report Writing	CO1,CO3
25	Organizing an Event	CO1,CO5
26	Technical Writing	CO1,CO3
27	Blog Writing	CO1,CO3
28	Mock Interview-I	CO1,CO2,CO5
29	Mock Interview-II	CO1,CO2,CO5
30	Achievement Test	CO1

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Total Practical Sessions	30	Total Practical Hours	60

Text Books

1. The Professional: Defining the New Standard of Excellence at Work Subroto Bagchi Penguin Books India Pvt. Ltd. Revised Edition,2011.
2. Cambridge Guide to IELTS. Pauline Cullen, Amanda French, Cambridge University Press, Reprint, 2017.
3. A Practical Course in Effective English Speaking Skills. J. K. Gangal, PHI Learning Private Limited, New Delhi, Print, 2012
4. English For Engineers. Dr. Shyamaji Dubey, Dr. Manish Kumar. Vikas Publication House Pvt. Ltd.New Delhi, Print, 2020.
5. Personality Development and Soft Skills. Barun K. Mitra, Oxford University Press, New Delhi , 7th impression, 2012.

References:

1. High-school English Grammar and Composition. Wren and Martin, S. Chand and Co., New Delhi, 1st edition, 2015.
2. The Ace of Soft Skills. Ajai Chowdry, Bala Balchandran, Pearson Publication, Delhi, 8th edition, 2017.
3. Effective Technical Communication. M. Ashraf Rizvi, McGraw Hill Education, Chennai,2nd edition, 2017.
4. Business Communication. Hory Sankar Mukerjee, Oxford University Press, New Delhi , 2nd edition, 2013.
5. Communicative English for Engineers and Professionals. Nitin Bhatnagar, Mamta Bhatnagar, Pearson Publication, Delhi, 1st edition, 2013.

Online Learning Resources

1. **Software:** Pronunciation apps (e.g., ELSA Speak, Speak English), grammar checkers (e.g., Grammarly).
2. **Online Platform** Coursera (for basic English courses), Duolingo, BBC Learning English.

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Course Information:

Class, Semester	F.Y. B. Tech, Semester - I	**Category**	**VS**
Course Code, Course Title	0ETVS107, IDEA Lab Workshop	**Type**	**L2**
Prerequisites	--		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	1	-	2	-	2

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Operate** basic workshop tools for material processing and assembly.
CO2	**Make** simple 2D and 3D designs using CAD software and prepare them using 3D printing, laser cutting, or CNC machining.
CO3	**Build** basic electronic circuits using sensors, LEDs, motors, and microcontrollers.
CO4	**Apply** fundamental programming concepts in embedded C (Arduino IDE) for controlling hardware and automating simple tasks.
CO5	**Integrate** mechanical parts and electronics to design and build working models or prototypes.

Syllabus:

Module	Contents	Lecture Hours
I	**Overview of IDEA Lab** Introduction to the IDEA Lab: Vision, objectives, **National Innovation Ecosystem** (IIC, Atal Innovation Mission, NISP), Importance of multi-disciplinary, project-based learning Inspirational case studies from IDEA Labs, Safety protocols, Do & Don'ts in IDEA Lab.	1
II	**Fundamentals of Design & Prototyping** **Design Thinking Basics**: Problem identification, ideation, prototyping, testing, and iteration, **Introduction to CAD Software**: Concepts of 2D and 3D modeling for various applications, File Formats for Fabrication: Understanding STL, DXF, G-Code, SVG, and their uses, Tolerances, fits, and design constraints for manufacturing.	2
III	**Digital Fabrication Technologies** **3D Printing**: Principles, types of 3D printers, materials, slicing software, and applications. **Laser Cutting & Engraving**: Principles, types of lasers, materials, design considerations, and safety. **CNC Router**: Introduction to CNC Router and Mini Desktop Lathe cum Milling operations, G-code fundamentals, material removal processes. **3D Scanning**: Principles of 3D scanning, applications in reverse engineering and quality control. **PCB Fabrication:** Introduction to PCB Milling Machine and PCB Prototype Machine for custom circuit boards.	3
IV	**Fundamentals of Embedded Systems & IoT** **Basic Electrical and Electronic Concepts:** Voltage, current, resistance, Ohm's Law, and fundamental components (resistors, capacitors, diodes, LEDs, sensors, actuators), Measuring Instruments **Overview of microcontrollers**: Overview of Arduino, ESP32, NodeMCU, and their applications in controlling hardware. Circuit simulation using TinkerCAD or Proteus. **IoT Basics**: Basic networking (Bluetooth/Wi-Fi/Ethernet), cloud integration	3
V	**Programming for automation** **Arduino IDE and Embedded C Programming**: Setup, basic syntax (setup(), loop()), digital	3

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	and analog I/O control. **Basic Control Systems:** Concepts of open-loop and closed-loop control with simple examples. **Introduction to Python.**	
VI	**Project Planning and IPR** **Innovation Process:** From idea generation to concept validation **Project Planning & Management:** Defining scope, setting timelines, budgeting, and resource allocation. ***Documentation and Presentation:*** *Writing a concept note, creating innovation posters, and* effective pitching techniques. **Intellectual Property Rights (IPR):** Basics of Patents, Copyrights, and Trademarks relevant to innovation.	3
	Total Lecture Hours	**15**

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Introduction, Lab Safety & Tool Familiarization	CO1
2	Hands on practice of Mechanical Workshop Tools	CO1
3	3D Printing of simple parts	CO2
4	Laser Cutting	CO2
5	*CNC Routing/ Engraving*	*CO2*
6	Basic Electronics circuit	CO3
7	PCB Design and Prototyping	CO3
8	Microcontroller Programming and Sensor Interfacing	CO4
9	Mini Project	CO5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. Veeranna D.K., AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2022
2. Saji T. Chacko, Susan S. Mathew, AICTE's Prescribed Textbook: Fundamentals of Electrical and Electronics Engineering (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2024
3. *Mehta S.D., Electronic Product Design Volume - I (Basics of PCB Design), 1st Edition, S Chand & Company, 2011*
4. Mehta-Gupta, Y.P.Mehta, Vishal Mehta, Workshop Calculation and Science, 1st Edition, Dhanpat Rai Publications, 2020

References:

1. A. K. Maini, Nakul Maini, All-in-One Electronics Simplified, 1st Edition, Khanna Book Publishing Company, 2021
2. J.G. Joshi, Electronics Measurements & Instrumentation, 1st Edition, Khanna Book Publishing Company, 2025
3. Dr. Sabrie Soloman, 3D Printing & Design, 1st Edition, Khanna Book Publishing Company, 2020
4. Kaushik Kumar, Hridayjit Kalita, Workshop/Manufacturing Practices, 5th Edition, S Chand & Company, 2011

Online Learning Resources

1. NPTEL Course on 3D Printing and Design for Educators, By Dr. Sharad K. Pradhan, NITTTR Bhopal https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview
2. NPTEL Course on Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software, By Prof. Ankur Gupta, IIT Delhi https://onlinecourses.nptel.ac.in/noc24_ee127/preview

Experiments that may be performed through virtual labs:

S. No	Experiment Name	Experiments Links
1.	3D Printing Virtual Simulation Lab	https://3dp-dei.vlabs.ac.in/
2.	Digital Fabrication of Flexible Circuit board	https://fab-coep.vlabs.ac.in/exp/digital-fabrication/
3.	Embedded System Design with 8051 and PIC Microcontroller	https://esd-coep.vlabs.ac.in/

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Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**BS**
Course Code, Course Title	**0ETBS108, Engineering Mathematics-II**					**Type**	**T1**
Prerequisites	0ETBS101, Engineering Mathematics-I						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	1	-	4	4		

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Determine equation of a curve and compute statistical measures to analyze data using statistical techniques
CO2	Express functions in series form Using Maclaurin's and Taylor's expansion
CO3	Determine unknown values from tabulated data using finite difference and interpolation techniques.
CO4	Use appropriate methods to solve integrals using special functions
CO5	Compute Area and Mass of a region using multiple integrals

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Curve fitting and Statistics:** Method of Least Squares, Fitting of Straight Line, Fitting of Parabola, Fitting of exponential curves, Lines of Regression.	**8**
II	**Statistical Measures**: Introduction, Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Partition values: Quartiles, Deciles and Percentiles, Concept of dispersion, Range, Quartile Deviation, Mean Deviation, Mean Square Deviation, Variance and Standard Deviation.	**8**
III	**Expansion of functions and Indeterminate forms**: Maclaurin's series Taylor's series, Standard expansions, Expansion of function using Standard series, Indeterminate forms.	**7**
IV	**Finite Differences and Interpolation:** Finite differences, Forward and Backward Difference Newton's forward Interpolation formula, Newton's backward Interpolation formula, Stirling Interpolation formula, , Newton's Divided Difference, Lagrange's interpolation formula.	**8**
V	**Special Functions:** Introduction to special function, Gamma function, Properties of Gamma function, Beta function, Properties of Beta function, Relation between Beta and Gamma functions, error function and its properties.	**7**
VI	**Multiple Integral and Its Applications:** Double Integrals, Triple integral, Change of Order of Integration, Change to polar coordinates, Applications to Area and Mass of plane lamina.	**7**
	Total Lecture Hours	**45**

List of Tutorial with CO Mapping

Sr.No	**Title of Tutorial**	**CO Mapped**
1	Fitting of straight line and Second-degree parabola	1
2	Fitting of exponential curves and lines of regression	1
3	Measures of Central tendency	1
4	Measures of dispersion	1
5	Expansions of functions using Maclaurin's and Taylor series	2
6	Indeterminate forms.	2
7	Interpolation with equal intervals	3
8	Interpolation for unequal intervals	3
9	Gamma function and properties	4
10	Beta function and Properties	4
11	Evaluation of multiple integrals	5
12	Applications of Double integrals	5

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Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das , Advanced Engineering Mathematics , 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal , Numerical Methods , 9th Edition, Khanna Publishers ., 2010

References:

1. Dr. B. S. Grewal , Higher Engineering Mathematics , 44th Edition, Khanna Publishers ,2018.
2. N. P. Bali, Manish Goyal , Advanced Engineering Mathematics , 7th Edition, Infinity science press ,2010.
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi Griha Prakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.
5. S. C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics , 10th Edition Sultan Chand and Sons Publisher,2000.

Online Learning Resources

1. NPTEL Course on Engineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta , Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course Business Statistics, by Prof. Mukesh Kumar Barua, IIT Roorkee https://nptel.ac.in/courses/110107114

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Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**BS**
Course Code, Course Title	**0ETBS109, Engineering Physics**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	3	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Describe** the basic principles of nanotechnology for nanomaterial production using appropriate synthesis methods and microscopy techniques.
CO2	**Use** the principles of magnetism and semiconductor physics to select suitable materials for engineering applications.
CO3	**Apply** optics concepts to analyze diffraction, polarization, lasers, and fiber optic transmission in engineering contexts.
CO4	**Apply** theoretical and practical knowledge to solve engineering problems in architectural acoustics and ultrasonic using appropriate formulas and experimental methods.
CO5	**Interpret** crystal structures and X-ray diffraction results to determine lattice parameters and interplanar spacing using Bragg's law and Miller indices.

Syllabus:

Module	Contents	Lecture Hours
I	**Diffraction & Polarization** : **Diffraction** - Introduction, Diffraction grating, Plane diffraction grating –construction and theory, Determination of wavelength of light using plane diffraction grating, Resolving power of grating, Numericals. **Polarization:-** Introduction, Polarization of light, Polarization by double refraction, Positive and Negative crystals, Laurent's half shade Polarimeter, Numericals.	6
II	**Laser and Fiber Optics :** **Laser**: Introduction, Principle of laser, Pumping and Population inversion, Characteristics of laser, Ruby Laser, He-Ne Laser, Applications of laser in engineering and medical field. **Optical fibre**: Introduction, Total internal reflection, Structure of optical fibre, Propagation mechanism of optical fibre, Numerical aperture, Acceptance angle, Skip distance, Attenuation, Types of optical fibre, Applications of optical fibre in engineering.	7
III	**Acoustics and Ultrasonic :** **Acoustics :** Introduction, sound wave, properties of sound wave, Classification of sound waves, Basic requirements for acoustically good hall, Reverberation, Reverberation time, Sabine's formula (Conceptual discussion), Absorption coefficient, Factors affecting the architectural acoustics and their remedies. **Ultrasonic:** Ultrasonic waves, Magnetostriction effect and Oscillator, Determination of wavelength and velocity of ultrasonic waves, Detection of ultrasonic waves, applications of ultrasonic waves Numericals.	8
IV	***Crystallography :*** Unit cell, Space lattice, Seven crystal system, Bravais space lattices, Properties of cubic unit cell, Relation between lattice constant and density, Interplanner spacing for cubic system, Miller indices, Symmetry elements in cubic crystal, X-ray diffraction, Bragg's law, Braggs X-ray spectrometer, X-ray spectra (Continuous and characteristics), Numericals.	7
V	**Semiconductors , Magnetic and Dielectric materials :** **Semiconductor** - Introduction, types of semiconductor, Band theory of semiconductor, Fermi energy and its location in semiconductor, conductivity of semiconductor, Hall effect. **Dielectrics** - Introduction to dielectrics, Dielectric parameter, dielectric polarization, types of polarization, Dielectric materials- solid, liquid, gaseous, Frequency and temperature dependence of dielectric material.	10

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	Magnetism - Types of magnetic material, soft and hard materials, Hysteresis effect, Domain theory of ferromagnetism.	
VI	**Nanophysics :** Introduction, Nanotechnology, nano-materials, Top-down and Bottom-up synthesis approach,, Ball milling method, Sol-gel synthesis method, Carbon nanotubes, Properties and applications of carbon nanotubes, Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM), Properties and applications of nano-materials .	7
	Total Lecture Hours	***45***

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Plane Diffraction Grating- Determination of the wavelength of light using plane diffraction grating.	3
2	Laurent's Half shade Polarimeter - Determination of specific rotation of optically active material.	3
3	Determination of wavelength of He-Ne laser light using diffraction grating.	3
4	Determination of divergence of He-Ne laser light	3
5	Numerical aperture of optical fibre: Calculation of NA of optical fibre using laser.	3
6	*Verification of inverse square law.*	3
7	Determination of band gap energy of given semiconductor.	2
8	Determination of the velocity of ultrasonic waves in given liquid and to determine the compressibility of the liquid	4
9	Kund's tube for determination of velocity of sound	4
10	Determination of the wavelength of the given monochromatic source of light by Newton's ring method	3
11	Study of B-H Curve of given sample	3
12	Study of Hall Effect and determination of Hall voltage	3
13	Determination of Miller Indices of a given plane and models	5
14	Study of 23 Symmetries in cubic crystal	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. M.N.Avadhanulu& P. G. Kshirsagar, A Text Book of Engineering Physics,12th Edition, S. Chand Publication,2018
2. P. K. Palanisamy, Engineering Physics, 2nd Edition, Sci Tech pub. (P) Ltd.2018
3. G Vijayakumari, Engineering Physics, 3rd Edition, Vikas Pub. House (P) Ltd ,2009
4. K.K.Chattopadhyay and A.N. Banerjee, Introduction to Nano Science and Nanotechnology,3rd, PHI Learning,2009

References:

1. David Halliday, Robert Resnick&Jearl Walker, Fundamentals of Physics,12th Edition,2021.
2. ResnickHalliday, Krane, Engineering Physics,8th Edition, John Wiley & Sons Pub.,2008.
3. R. K. Gaur & Gupta S. L, Engineering Physics,8th Edition, DhanapatRai Publication,2008
4. Sulbha K. Kulkarni, Nanotechnology Principles and Practices, 4th Edition, Springer,2007
5. Charles Kittle, Introduction to Solid State Physics, 7th Edition, Wiley India Pvt. Ltd,2008
6. V. Raghvan, Materials Science and Engineering,5th Edition, PHI Learning,2006.

Online Learning Resources

1.For optics- https://nptel.ac.in/courses/122/107/122107035/
2.For Quantum Physics -https://nptel.ac.in/courses/122/106/122106034/
3.For Ultrasonic -- https://freevideolectures.com/course/3531/engineering-physics-i/8
4. For Solid State Physics -- https://nptel.ac.in/courses/115/105/115105099/

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Photoelectric Effect	https://mp-amrt.vlabs.ac.in/exp/photoelectric-effect/index.html
2.	Numerical Aperture of Optical Fiber	https://lo-amrt.vlabs.ac.in/exp/numerical-aperture-optical-fiber/
3.	LASER Beam divergence and spot size	https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/

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Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**ES**
Course Code, Course Title	**0ETES110, Engineering Graphics**	**Type**	**LIT2**
Prerequisites	--		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	03	-	02	2	04

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	--

Course Outcomes (COs) :

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

CO1	**Construct** projections of straight lines in various positions with reference planes, by variation in inclination, grade, bearing, and initial conditions.
CO2	**Complete** the projection of planes and Solids in various positions relative to reference planes, considering variations in initial conditions and inclination, to achieve an accurate shape in inclined positions.
CO3	**Draw** the three orthographic views for a given three-dimensional pictorial view, concerning the direction of viewing in first-angle projection, explaining the sectional view, hidden object and dimensions with CAD.
CO4	**Develop** a 3-dimensional isometric view converted from two or three orthogonal views to illuminate a 3D object.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Fundamentals of Engineering Graphics and Projections of Lines** **Fundamentals of Engineering Graphics:** Introduction to Drawing instruments and their uses. Different types of lines used in drawing practice, Dimensioning system as per BSI, Introduction to Auto CAD. **Projections of Lines:** Introduction to First angle and third angle methods of projection. Projections of points on regular and auxiliary reference planes. Projections of lines (horizontal, frontal, oblique and Profile lines) on regular and auxiliary reference planes. True length of a line, Point View of a line, angles made by the line with reference planes. Projections of intersecting lines, Parallel lines, perpendicular lines, and skew lines. Grade and Bearing of a line.	9
II	**Projections of Planes** Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes), Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes. (Circle & regular polygon up to hexagon).	6
III	**Projections of Solids** Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes. (Excluding Frustum and Sphere)	7
IV	**Introduction to Computer Aided Drafting** Introduction to CAD & Graphical user interface of the CAD software, Draw Commands, Drafting Aids(Limits, layer, Dimensioning, Object snap, Zoom), Modify Commands.	8
V	**Orthographic Projections** Lines used, selection of views, spacing of views, dimensioning and sections. Drawing required views from given pictorial views (conversion of pictorial views in to orthographic views), including sectional orthographic views.	8
VI	**Isometric Projections** Introduction to isometric. Isometric scale, Isometric projections and Isometric views /drawings. Circles in isometric view. Isometric views of simple solids and objects.	7
	Total Lecture Hours	45

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List of Experiments with CO Mapping		
S.No	**Title / Topic of the Experiment**	**CO Mapped**
1	Introduction to Engineering Drawing	CO 01
2	Introduction to Auto CAD	CO 03
3	Projection of Line	CO 01
4	Projection of Plane	CO 02
5	Projection of Solid	CO 02
6	Orthographic Projection	CO 03
7	Orthographic Projection with Auto CAD	CO 03
8	Isometric Projection	CO 04
9	Isometric Projection with Auto CAD	CO 04
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. W. J. Luzadder, Fundamentals of Engineering drawing, Revised Edition, Prentice Hall of India, 1999.
2. N. D. Bhatt, Machine Drawing, 15th Edition, Charotar Publishing House Pvt. Ltd.-Anand, 2007.
3. Jhole, Dhananjay, Engineering Drawing, Revised Edition, Tata McGraw-Hill, 2011.
4. M.L. Mathur, Engineering Drawing & Graphics, RevisedEdition, Jain brothers, 1999.

References:

1. K. Venugopal, Engineering Drawing and Graphics, 5th Edition, New Age Publication, 2004.
2. R. K. Dhawan, A textbook of Engineering Drawing, Revised Edition, S. Chand and Co, 2008.
3. N. B. Shaha and B. C. Rana, Engineering Drawing, 2nd Edition, Person Education, 2012.
4. K. L. Narayana, Machine Drawing, New Age Publication

Online Learning Resources

1. NPTEL Course on *Engineering Drawing*, by Prof. P. S. Robi, IIT Guwahati
   https://nptel.ac.in/courses/112103019
2. NPTEL Course *on Engineering/ Architectural Graphics- Part I- Orthographic Projection*, by Prof. AvlokitaAgarwal, IIT Roorkee
   https://nptel.ac.in/courses/124107157
3. NPTEL Course *on Engineering Graphics and Design*, by Prof. NareshDatla, Prof. S. R. Kale, IIT Delhi
   https://nptel.ac.in/courses/112102304
4. NPTEL Course *on Engineering Drawing and computer graphics,* by Prof. RajaramLakkaraju, IIT Kharagpur

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Established: 1999

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

(An Empowered Autonomous Institute)

Department of Electronics and Telecommunication Engineering

Course Information:

Class, Semester	F.Y. B.Tech – Semester I					**Category**	**ES**
Course Code, Course Title	**0ETES111-Programming for Problem Solving**					**Type**	**L1**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	2	-	2	2	3		

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	50

Course Outcomes (COs) :

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

CO1	Prepare an algorithm and draw a flowchart to accurately solve various mathematical problems by using structured approach.
CO2	Apply the fundamental concepts like data types, operators to solve mathematical problems by using the C language.
CO3	Apply the decision and looping constructs to solve the problems related to decision, repetitive statements for real time problem statement using C
CO4	Develop a C program to demonstrate the modular approach by using the concept of function, structure and pointer
CO5	Write, Compile and debug C program for various problem statements by using structured approach.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Basics of Programming:** Computer, Hardware, Software, I/O-Devices, Memory, CPU, The meaning of algorithms, Flowcharts, Pseudo codes, Writing algorithms and drawing flowcharts for simple exercises, Memory Concepts, C Program development environment.	**4**
II	**C Fundamentals:** Importance of 'C' Language, History, Structure of 'C' Program, Sample 'C' Program, Constants, Keywords and Identifiers, variables and data types, Enumeration. Operators and expressions, Managing input / output operations, Type Casting, Control statements- Decision making, Case control & Looping Constructs.	**7**
III	**Array:** The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays. Strings-Declaring and initialing character array, reading and writing string to/from terminal, arithmetic operations on characters, putting strings together, string handling functions	**5**
IV	**Functions:** Need of user defined functions, elements of User defined functions, defining functions, return values and their types, function calls, function declaration, methods of parameter passing, Recursion, Scope rule of functions, user defined and library functions.	**4**
V	***Structure & Pointers:*** Need of Structure, Defining a structure, Declaring and accessing structure variables, Structure initialization, Copying and comparing structure variables, Array of structures, Structures and functions, Unions. Understanding pointers, Accessing the address space of a variable, Declaring and initializing pointer variables, Accessing a variable through its pointer, Pointer expressions, Types of pointers, Dynamic memory allocation malloc0, calloc0, realloc0, free0	**6**
VI	**File Handling:** Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, C preprocessor.	**4**
	Total Lecture Hours	**30**

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List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Write an algorithm and draw flowchart for given problem statements.	1
2	Implement a program using different data types and operators in C.	2
3	Implement a program using decision control statements.	3
4	Implement a program using repetitive control statements (for, while, do-while).	3
5	Implement a program using a selection control statement.	3
6	Implement a program using nested loop (for, while loop).	3
7	Program to demonstrate one dimensional array	3
8	Program to demonstrate two-dimensional array	3
9	Implement a program to demonstrate String handling functions.	3
10	Implement a program using user defined functions in C.	4
11	Program to demonstrate concept of recursion (factorial, Fibonacci)	4
12	Implement a program to demonstrate the concept of structures in C.	4
13	Implement a program to demonstrate the concept of arrays of structures in C.	4
14	Implement a program to demonstrate the concept of pointers in C.	4
15	Implement a program to demonstrate the concept of file handling in C.	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. ISRD Group , Programming and Problem Solving Using C Language , McGraw-Hill Publications ,2012.
2. Yashwant Kanetkar , Let Us C , 3rd Edition, BPB , 2011.
3. Harvey M. Deitel, Paul J. Deitel, Abbey Deitel , C How to Program ,2nd Edition, Pearson ,2009.
4. E. Balaguruswamy , Programming in ANSI C , 4th Edition, BPB Publications, 2008

References:

1. D. M. Ritchie, The 'C' Programming Language, 2nd Edition, Pearson ,1998.
2. Sidnal, C Programming Laboratory: Handbook for Beginners, 1st Edition, Wiley India Limited, 2012.
3. Yashwant Kanetkar, Understanding Pointers in C, 4th Edition, BPB Publications,2001.
4. Yashwant Kanetkar, Test Your C Skills, 5th Edition, BPB Publications, 2013

Online Learning Resources

1. NPTEL Course on Computer Programming By Dr. T. Sugirtha IIIT Tiruchirappalli https://nptel.ac.in/courses/111105035
2. Learn C Programming, https://www.programiz.com/c-programming
3. C Programming Tutorials, https://www.tutorialspoint.com/cprogramming/index.htm
4. C Programming Language, https://www.geeksforgeeks.org/c-programming-language/

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Electronics and Telecommunication Engineering

Established: 1999

Course Information:

Class, Semester	F.Y. B. Tech – Semester II	**Category**	**ES**
Course Code, Course Title	0ETES112 - Design Thinking Lab	**Type**	**L2**
Prerequisites			

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	-	-	2	1	1

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Explain** the principles and process of Design Thinking and its application in problem-solving.
CO2	**Identify** and define real-world problems using user-centric observation and empathy techniques.
CO3	**Conduct** user research through surveys, interviews, and persona building to derive user needs and insights.
CO4	**Apply** ideation techniques to generate innovative and feasible solutions for identified problems.
CO5	**Develop** and present prototypes and communicate their solutions effectively using charts, posters, and model presentations.

Syllabus:

Module	**Contents**
I	Introduction to Design Thinking, Design Thinking Process
II	Empathize Phase: Empathy and Ethics, User Perspective, Activities – Empathy Map, Planning, Persona building.
III	Customer Journey Mapping, Observation of stakeholders, Defining and Conceptualization of problem.
IV	Ideation, Activities – 5 Whys & 1 How, Story boarding, Brainstorming.
V	Prototype – Types, Mindsets, Tools.
VI	Testing – Scenario, Methods, Refinements & Recommendations.

List of Experiments with CO Mapping

S.No	**Title / Topic of the Experiment**	**CO Mapped**
1	**Introduction to Design Thinking** **Activity:** Make a group of 2-4 students. Give each group a simple, relatable problem (e.g., "Long queues at the campus canteen" or "Difficulty in finding *parking on campus*"). Ask them to: Empathize: Identify users and their pain points. Define: Write a clear problem statement. Ideate: Brainstorm possible solutions. Sketch: Draw their proposed solution on chart paper. Present: Each group will present their idea briefly.	CO1, CO2
2	**Identification of Problems** **Activity 1: Present case** study (in group) how companies like **Airbnb, Apple, IDEO, Netflix, Samsung, Toyota** used Design Thinking to drive innovation. **Activity 2: User Interviews** – The student or group should walk around the campus or their locality to observe and identify **at least three (per student) real-life problems** faced by users (students, faculty, staff, and community). Conduct interviews to gather qualitative insights. Steps: 1. **Observation:** Note down pain points using observation and informal interviews. 2. **Listing:** Write a list of problems identified. 3. **Shortlisting:** Apply criteria like relevance, feasibility, user impact, and	*CO1, CO2*

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	alignment with SDGs to shortlist **one problem** to work on for further Design Thinking phases.	
3	**Selection of Problems** **Activity:** Students will present (PPT) their selected problem, why they chose it, who the users are, and the evidence collected.	CO1, CO2
4	**Designing of Empathy Map** **Activity: Prepare Empathy Map** – Visualize what users say, do, think, and feel.	CO1, CO3
5	**Customer Survey and Analysis** **Activity:** Students create a structured survey (MCQ, likert scale, open ended questions etc.) using google forms and prepare charts (bar, pie etc) and do the analysis.	CO1, CO3
6	**Persona Building** **Activity:** Based on findings from ***Observations and interviews, Customer Survey and Analysis*** from previous experiments, identify pattern i.e. common characteristics, behaviors, needs, pain points, and goals among users and create persona template.	CO1, CO3
7	**Customer Journey Map** **Activity:** Select the persona created in the previous experiment, define the Scenario, List Stages/Phases of the Journey, Map User Actions, Identify User Emotions, Identify Touchpoints, Identify Pain Points and opportunities for Improvement.	CO1, CO3
8	**Defining the problem** **Activities:** • **Observation of Stakeholders** – Note behaviors and pain points. • ***5 Whys Method (Drill Down)*** – *Uncover root causes behind a problem.* • **Root Cause Mapping** – Visual diagram connecting symptoms to core issues. **Refine Problem Statement** – Create a focused, actionable problem definition.	CO1, CO3
9	**Poster Presentation** **Activity:** Use A2/A1 sheet and draw charts, diagrams, sketches, and minimal text to represent experiment no 1-8.	CO1, CO2, CO3
10	**Ideation** **Activities:** • **SCAMPER Model** – Modify existing ideas by Substituting, Combining, Adapting, etc. • **Brainstorming (Crazy 8 Method)** – Rapid sketching of 8 ideas in 8 minutes. • **Mind Mapping** – Visually connect ideas around a central problem/theme. Use the suitable and best one activity from above.	CO1, CO4
11	**Prototype Building** **Activities:** • **Storyboarding** – Sketch out user scenarios and interactions. • **Prototyping** – Build a working model or prototype or model.	CO1, CO5
12	**Testing** **Activities:** • **Scenario-Based Testing** – Test ideas in realistic user scenarios. **Peer Testing –** Get feedback from other participants or teams.	CO1, CO5
13	**Refinement & Recommendation** **Activities:** • **Final Presentation** – Showcase prototype or working model. • **Documentation of Learnings** – Reflect on the process, improvements, and impact (Make a report). Apply for IPR/Incubation/Research Grant/Paper Publication.	CO1, CO5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

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Text Books
1. E Balaguruswamy, Developing Thinking Skills (The way to Success), First Edition, Khanna Book Publishing Company, 2023
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Harvard Business Review, 2008
3. R T Krishnan & V Dabholkar, 8 steps to Innovation, First Edition, Collins Publishing, 2013
References:
1. Nigel Cross, Design Thinking, First Edition, Bloomsbury, 2011
2. Idris Mootee, Design Thinking for Strategic Innovation, First Edition, Wiley, 2013
Online Learning Resources
1. NPTEL_Design Thinking - A Primer https://youtu.be/AamBSYPJlcA?si=wJDNT4L9q1NB-6T9
2. Design Thinking and Innovation https://www.coursera.org/learn/designthinkingandinnovation

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Established: 1999

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Department of Electronics and Telecommunication Engineering

Course Information:

Class, Semester	FY. B.Tech, Semester - II	**Category**	**PC**
Course Code, Course Title	**0ETPC113, Analog and Digital Electronics**	**Type**	**LIT1**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	2	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) :

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

CO1	**Explain** the characteristics, specifications and applications of basic electronic components, sources and measuring equipment used in Analog Electronics.
CO2	**Analyze** the operation of diodes and their applications in rectification, clipping, clamping and voltage regulation circuits.
CO3	**Interpret** and evaluate the Characteristics and biasing techniques of BJTs, FETs and MOSFETs.
CO4	**Solve** digital system problems by applying number system concepts such as number system conversions, binary arithmetic, and complement operations.
CO5	Implement and analyze combinational and sequential logic circuits using logic gates and flip-flops for basic digital system applications.

Module	**Contents**	**Lecture Hours**
I	**Electronic Components, Sources, and Measuring Equipment** Evolution of Electronics – Impact of Electronics in Industry and Society – Familiarization of Resistors, Capacitors, Inductors-types and specifications, Introduction to– modern test equipment.	**7**
II	**Diodes & Applications:** PN-junction diode-ideal/practical, Filter, load line, clippers, clampers, half-wave & full-wave rectifiers, voltage regulation; special diodes – Zener, LED, Schottky, photodiode, varactor, tunnel, TVS diodes.	**9**
III	**BJT & FET Characteristics & Biasing:** BJT structure, operation CB/CE/CC configurations, biasing techniques, JFET- operation and MOSFET device operation and transfer characteristics-enhancement/depletion, CMOS, Introduction to OPAMP	**9**
IV	**Fundamentals of Digital System:** Number systems: Decimal, Binary, Octal, Hexadecimal, Binary coded decimal (BCD), Number system conversions, Binary Arithmetic, 1's and 2's complements, Logic gates.	**7**
V	**Combinational Logic Circuits:** Standard representation for logic functions, K-map, Minimization of logic functions using K-map, Half Adder, Full Adder, Half Subtractor, Full Subtractor, 1-Bit Comparator, Multiplexer, Demultiplexer, Encoder, Decoder.	**6**
VI	**Sequential Logic Circuits:** S-R flip-flop, D flip-flop, J-K flip-flop, T flip-flop. Applications of flip-flops: Shift registers, Counters: Ripple/asynchronous counters, Synchronous counters, Counters design using flip flops, Ring counter & Twisted ring/ Johnson counter.	**7**
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

Sr.No	**Title of Tutorial**	**CO Mapped**
1	Study experiment on basic electronic components and equipment's to understand fundamentals in Analog Electronics.	1
2	Plot V-I Characteristics of PN junction diode.	2
3	Experimental verification of Rectifier circuits -Half Wave Rectifier.	2

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4	Experimental verification of Rectifier circuits -Full Wave Rectifier (Centre Tap, Bridge).	2
5	Experimental Verification of Clipper Circuits.	2
6	Experimental Verification of Clamper Circuits.	2
7	Determine the performance characteristics of BJT using DC biasing analysis of CE configuration on Proteus.	3
8	Verification of Basic Logic Gates	4
9	Design and Verification of Combinational Circuits	4
10	Implementation of Code Conversion and Data Routing Circuits	4
11	Design and Verification of Flip-Flops	5
12	Implementation of Sequential Circuits using Flip-Flops	5
Total Practical Sessions: 15	**Total Practical Hours**	**30**

Text Books

1. Robert L. Boylestad and Louis Nashelsky, Electronic devices and circuit theory, 11th Edition, PHI/Pearson Education ,2015.
2. Ramakant A. Gayakwad , Op-Amps & Linear Integrated Circuits , 4th Edition, PHI Publication New Delhi,2015.
3. A. Anandkumar, Fundamentals of Digital Circuits , 4th Edition, PHI Learning Pvt. Ltd, 2008.
4. Thomas L/ Floyd, Digital Fundamentals , 11th Edition, Pearson Education , 2015.

References:

1. Millman and Halkias, Satyabratajit, Electronic Devices & Circuits, 3rd Edition, McGraw Hill Education India,2012.
2. Albert Malvino and David J. Bates, Electronic Principles , 7th Edition, Tata McGraw Hill ,2014.
3. M. Morris Mano, Michael D. Ciletti , Digital Design, 6th Edition , Pearson, 2017
4. R. P. Jain , Modern Digital Electronics, 5th Edition, McGraw Hill Education (India),2023.

Online Learning Resources

1. NPTEL Course on Analog Circuits, by Prof. Jayanta Mukherjee, IIT Bombay https://nptel.ac.in/courses/108101094
2. NPTEL Course on Analog Circuits and Systems, by Prof. Shanthi Pavan, IIT Madras. https://nptel.ac.in/courses/108106188
3. NPTEL Course on Analog IC Design, Prof. Aniruddhan S., Prof. Nagendra Krishnapura, IIT Madras. https://nptel.ac.in/courses/108106105
4. NPTEL Course on Digital Circuits, Prof. Santanu Chattopadyay, IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc24_ee147

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Department of Electronics and Telecommunication Engineering
Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – II					**Category**	**IKS**
Course Code, Course Title	0ETIKS114, Indian Knowledge System					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	2	-	-	-	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

CO1	**Explain** the historical context and evolution of the Indian Knowledge System (IKS) and its relevance to modern engineering.
CO2	**Analyze** ancient Indian mathematical, astronomical, and technological methodologies and compare them with contemporary engineering practices.
CO3	**Apply** concepts from Ayurveda and ancient biological sciences to modern problem-solving in healthcare and related fields.
CO4	**Evaluate** traditional Indian architecture, materials, and construction principles as early forms of sustainable engineering design.
CO5	**Integrate** philosophical and scientific logic from Indian thought into ethical decision-making and sustainable engineering practices.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction & Historical Context** 1. Overview of the Indian Knowledge System: Philosophy and Scope 2. Historical timelines and key epochs 3. Geographical and cultural influences on ancient Indian science 4. Interdisciplinary approaches in ancient India. 5. *Comparative analysis with other ancient civilizations*	5
II	**Mathematics & Astronomy in Ancient India** 1. Foundations of Vedic Mathematics and its modern applications 2. Concepts of zero, decimal system, and number theory 3. Astronomical instruments and observational techniques 4. Calendrical systems and time measurement in ancient India 5. Engineering parallels in algorithmic design and computational thinking	5
III	**Ayurveda and Life Sciences** 1. Introduction to Ayurveda: Philosophy, doctrines, and methodologies 2. Medicinal systems and their chemical/pharmacological principles 3. Human physiology and surgical techniques in ancient texts (e.g., Sushruta Samhita) 4. Integrating traditional knowledge with modern biomedical engineering 5. Innovations in material sciences: Natural polymers and biocompatible materials	5
IV	**Architectural Knowledge & Engineering Innovations** 1. Ancient Indian architecture: Principles, materials, and techniques 2. Urban planning and infrastructure in historical Indian kingdoms 3. Structural innovations: Temples, forts, and water management systems 4. Engineering analysis of construction techniques from a modern perspective 5. Case studies: Earthquake-resistant designs in ancient constructions	5

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V	**Philosophy, Science & Ethics** 1. Indian philosophical schools and their perspectives on science 2. The concept of Rta (cosmic order) and its engineering analogies 3. Early scientific inquiry and epistemology in classical texts 4. Ethics, sustainability, and social responsibility in engineering 5. Integration of moral values and technical rigor in project design	5
VI	**Contemporary Relevance & Innovation** 1. Bridging ancient wisdom with modern technology 2. Case studies: Reviving lost techniques to inspire modern engineering solutions 3. Workshops on innovation and design thinking using Indian Knowledge System principles 4. Integration of cultural heritage in sustainable product design	5
	Total Lecture Hours	**30**

Text Books

1. Indian Knowledge Systems: An Introduction by Dr. Vivek Ramaswamy, Oxford University Press,2nd, 2005.
2. Traditions of Indian Science: A Textbook by Dr. Shyam R. Jha, Cambridge University Press, 1st, 2010.
3. Contemporary Perspectives on Ancient Indian Wisdom by Dr. Arvind Sharma, Routledge, 1st, 2013.
4. Foundations of the Indian Knowledge System by Dr. Meera Nair, Sage Publications, *3rd, 2015.*
5. Indian Thought and Science: Bridging the Past and Present by Dr. Ram Prasad, Springer, 2nd, 2008.

References:

1. Encyclopedia of Indian Intellectual Heritage by Dr. Anil Kumar, Oxford University Press, 1st, 2012.
2. Indian Philosophy and Science: A Reference Guide by Dr. Lalit Singh, Cambridge University Press, 2nd, 2014.
3. The Vedic and Post-Vedic Traditions: A Reference Book by Dr. Pradeep Kumar, Routledge, 1st, 2003.
4. Handbook of Indian Knowledge Systems by Dr. Sunita Reddy, Sage Publications, 1st, 2016.
5. Traditional Indian Sciences: An Annotated Bibliography by Dr. Kavita Menon, Springer, 1st, 2020.

Online Learning Resources

1. https:// https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

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