TULSIRAMJI GAIKWAD-PATIL
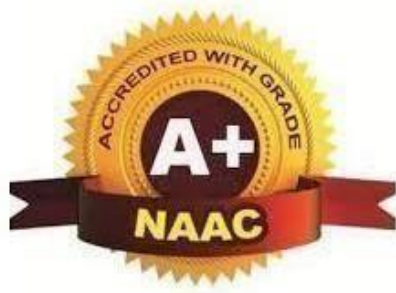## College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute

ACCREDITED WITH GRADE
A+
NAAC

NBA
NATIONAL BOARD
of ACCREDITATION

DEPARTMENT OF ELECTRICAL ENGINEERING

B. Tech. Electrical

Engineering IV Semester
Teaching Scheme & Syllabus

Considering

National Education Policy 2020

From

Academic Year 2024-25

Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of Institute

1. To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

2. To provide facilities and services to meet the challenges of Industry and Society.

3. To facilitate socially responsive research , innovation and entrepreneurship.

4. To as certain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

To emerge as a learning hub and center of excellence in the domain of Electrical Engineering.

Mission of the Department

1. To disseminate knowledge replete with quality education in the field of Electrical Engineering in meticulous and methodical manner.

2. To provide platform to address societal issues as well as challenges faced by industries.

3. To develop research culture and inculcate innovative and entrepreneurial skills.

4. To ensure overall development of students and staff by instilling knowledge and professional ethics as a part of life long learning.

Program Education Objectives (PEO)

1. Demonstrate and analyze the fundamental knowledge with respect to the various domains of Electrical Engineering.

2. Investigate and apply modern tools to develop innovativeness in different applications of Electrical Engineering domain.

3. Integrate new emerging trends and concepts in Electrical Engineering profession for sustainable development.

4. Develop professionals having managerial and administrative Qualities for Electrical Engineering related industries.

5. Promote lifelong learning,to prepare for the next challenges in the field of Electrical Engineering.

Program Outcomes (PO)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of theinformationtoprovidevalidconclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tool including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO1: Formulate the solutions to Electrical and Electronics Engineering problems using the basic concepts.

PSO2: Develop the process to interpret networks parameters in power system operation and control with their protection and driving mechanisms.

PSO3: Apply project-based learning to conduct experiments with Electrical Machines, Power Electronics to develop energy efficient systems.

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme : B. Tech Electrical Engineering (NBA Accredited)

Scheme of Instructions: Second Year B. Tech .in Electrical Engineering (As Per NEP 2020)

Semester–IV

SN	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	IV	PCC	EE	BEE32401	Electromagnetic Fields	T	3	-	3	3	30	10	60	3 Hrs	100
2	IV	PCC	EE	BEE32402	Transformer and DC Machine	T	3	-	3	3	30	10	60	3 Hrs	100
3	IV	PCC	EE	BEE32403	Introduction to Power System	T	3	-	3	3	30	10	60	3 Hrs	100
4	IV	OEC	EE	B$$324XX	Open Elective-II	T	2	-	2	2	15	5	30	2 Hrs	50
5	IV	VEC	BS&H	BSH32404	Leadership and Team Dynamics	P	4		4	2	-	50	50	2 Hrs	100
6	IV	VSEC	EE	BEE32406	1. PLCProgramming 2. AUTOCADElectrical(with Geo Coordinate Mapping) 3. MATLAB	P	-	4	4	2	-	25	25	2 Hrs	50
7	IV	PCC	EE	BEE32407	TransformerandDC Machine	P	-	2	2	1	-	25	25	2 Hrs	50
8	IV	AEC	CE	BCE32408	SustainableDevelopment Goals	T	2	-	2	2	15	5	30	2 Hrs	50
9	IV	EEMC	BA	BBA32409	Managerial Economics	T	2	-	4	2	15	5	30	2 Hrs	50
10	IV	MDM	CSE	BCS32411	Python Coding Lab	P	-	4	4	2	-	25	25	2 Hrs	50
					Total		17	10	29	22	135	170	395	23 Hrs	700

Course Category	BSC/ESC(Basic Science Course/ Engineering Science Course.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	SEC(Skill Course)	HumanitiesSocial Science &Management	Experiential LearningCourses	CC (Liberal LearningCourses)
Credits	--	10	--	04	02	06	--	--
CumulativeSum	16/13	19	--	10	06	14	02	04

<u>PROGRESSIVE TOTAL CREDITS : 63+22=85</u>

Program: Electrical Engineering

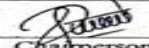## List of **Program Electives** offered By Electrical Engineering Department (NBA Accredited)

Program Elective- I	Program Elective-II	Program Elective-III	Program Elective- IV	Program Elective-V
SemesterV	SemesterVI	SemesterVI	SemesterVII	SemesterVIII
BEE33505-Solar EnergyUtilization	**BEE33604-**Wind EnergyUtilization	**BEE33607-**Biomass Energy and its Utilization	**BEE34703**–Technologies for Clean and Renewable Energy Production	**BEE34804-**Energy Audit and Management
BEE33506-UtilizationofElectrical Energy	**BEE33605**–Power PlantEngineering	**BEE33608-**Electrical Distribution System	**BEE34704-** Elements of Substation Design	**BEE34805-**Power System Operation & Control
BEE33507-High VoltageEngineering	**BEE33606-**FlexibleAC TransmissionSystem	**BEE33609**–ElectricVehicles	**BEE34705-**Introduction to Smart Grid	**BEE34806**–Power System Deregulation

Program:ElectricalEngineering

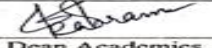## List of **Open Electives** offered By Electrical Engineering Department (NBA Accredited)

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BEE32307: Introduction to Renewable Energy Sources	**BEE32404:**Power Plant Engineering	**BEE33504:**Energy Audit

CourseCategory	BSC (BasicScienceCourse)	ESC (Engineering ScienceCourse.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	Multidisciplinary courses	VSEC (SkillCourse)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses	Semester Wise Credits
Semester-I	10	05	02	--	--	02	--	--	02	**21**
Semester-II	08	08	--	--	--	02	02	--	02	**22**
Semester-III	--	--	08	--	06	01	04	02	--	**21**
Semester-IV	--	--	10	--	04	02	06	--	--	**22**
Semester-V	--	--	11	04	06	--	--	--	--	**21**
Semester-VI	--	--	08	08	02	02	--	--	--	**20**
Semester-VII	--	--	04	02	02	--	--	12	--	**20**
Semester-VIII	--	--	04	06	02	--	--	08	--	**20**
CumulativeSum	**18**	**13**	**47**	**20**	**22**	**08**	**12**	**22**	**04**	**166**

Second Year (Semester-IV)B. Tech. Electrical Engineering

BEE32401:Electromagnetic Fields

Teaching Scheme				ExaminationScheme	
Lectures	3Hrs./week			**CT**	30 Marks
Tutorial	0Hrs./week			**CA**	10 Marks
TotalCredit	3			**ESE**	60 Marks
				Total	100 Marks
				Duration of ESE:03Hrs.00Min.	

Course Objective:	
1	To make students able to apply different an alytical tools on electrical networks for solving them
2	To analyze the behavior of the circuit's response in time domain and frequency domain.
3	To know the student show to apply the frequency analysis to circuit with different in put signals.

Course Contents		Hours
UnitI	**Vector Analysis:**Review of Scalars and vectors, Vector Algebra, Rectangular Co-ordinate System, Cylindrical Co-ordinate System, Spherical Co-ordinate System and transformation of Cartesian to Cylindrical, Cartesian to Spherical and vice versa.	**(9)**
UnitII	**Coulomb's law, Electrical field intensity:** Coulombs Law, Electric field intensity, field due to continuous volume charge distribution, field of point charge, field of line charge, field of sheet charge. **Electric flux density, Gauss's law, Divergence:** Electric Flux density, Gauss's law and Applications of Gauss's law, the divergence theorem.	**(9)**
UnitIII	**Potential of charge system, Conductors, Dielectric, Poison's and Laplace Equations:** Definition of potential difference and potential, the potential field of a point charge, potential gradient. Current Density, Continuity Equation & its point form, the nature of dielectric materials, boundary conditions for perfect dielectric materials, Poisons and Laplace Equation.	**(9)**
UnitIV	**The steady Magnetic Field and Magnetic forces:** Biot Savart's law, Ampere's Circuital law, Stoke's theorem, magnetic flux density, scalar and vector magneticpotentials. Force on moving charge, force between differential current elements, nature of magnetic material.	**(9)**
UnitV	**Boundary conditions, Maxwell's equation and wave propagation:** Faraday's law, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Wave propagation, Poynting vector, skin effect.	**(9)**

Text Books

1	Fundamentals of Electromagnetic Fields, A.U. Tinguria,Denett and Co., 3rd edition,2014
2	W.H. Hay.t, "Engineering Electromagnetics", TMH Publication, 9th edition, 2019
3	A. Pramanik, "Electromagnetism - Theory and applications", PHI Leaming Pvt. Ltd, New Delhi, 2012.

Reference Books

1	N.N.Rao Electromagnetic Engg. 5thEdition, Prentice Hall. 2005.

2	Krauss Electromagnetic Engg. IV Edition,Tata Mc Graw Hill.5^{th}Edition 2017
3	Shevgaonkar Electromagnetic Waves,Tata Mc Graw Hill 2002

	Course Outcomes	**CL**
BEE32401.1	**Determine** the unit vector, magnitude & angles in the specified criteria by using vector algebra.	**3**
BEE32401.2	**Evaluate** the physical quantities of electromagnetic fields by using Coulomb's law, Gauss's law and Divergence theorem.	**3**
BEE32401.3	**Calculate** the potential of charge and current density of boundary conditions for dielectric materials using Poison's and Laplace Equations.	**3**
BEE32401.4	**Find** the magnetic Field Intensity and Density of magnetic material with the help of Biot Savart's law Ampere's Circuital law and Stoke's theorem	**3**
BEE32401.5	**Discriminate** magnetic boundary conditions, Point form & Integral form of Maxwell's equation.	**4**

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road,Nagpur-441108
NAAC Accredited (A+ Grade)& NBA Accredited
An Autonomous Institute affiliated to RTMNU Nagpur

Second Year (Semester-IV)B. Tech. Electrical Engineering
BEE32402:Transformer and DC Machine

Teaching Scheme			Examination Scheme	
Lectures	3Hrs./week		**CT**	30Marks
Tutorial	0Hrs./week		**CA**	10Marks
TotalCredit	3		**ESE**	60Marks
			Total	100Marks
			Duration of ESE:03Hrs.00Min.	

Course Objective:

1	To analyze construction, working, EMF equation, efficiency, and losses.
2	To understand connection types, vector groups, and operational principles.
3	To apply cooling, testing, and maintenance methods following IS standards.
4	To explore special transformers and smart technologies like IoT and cybersecurity.
5	To examine classification, construction, and control of DC machines.

Course Contents		Hours
UnitI	**Single-Phase Transformers** Construction, working principle, EMF equation. Phasor diagrams under load, losses, efficiency, and voltage regulation. Equivalent circuit and parameter determination using O.C. and S.C. tests. Performance evaluation and harmonics mitigation techniques.	**(9)**
UnitII	**Three-PhaseTransformer:** Construction, operating principles, connection types (Δ-Δ, Δ-Y, Y-Δ, Y-Y), phase shift, vector groups, and significance. Parameter calculation using O.C. and S.C. tests. Parallel operation, load sharing, Scott connections,	**(9)**
UnitIII	**Cooling, Testing, and Maintenance:**Cooling methods:natural air, forced air, oil-based. Introduction to Indian Standard Guideline. Testing: dielectric strength, insulation resistance, polarity, and winding resistance. Diagnostics like DGA, thermal imaging, and preventive assessments. Maintenance as per Indian Standards (IS),	**(9)**
UnitIV	**Special Transformers and Emerging Technologies:** Special transformers: instrument, isolation, furnace, rectifier, and auto-transformers. Smart transformers with IoT monitoring, AI-based maintenance, and efficiency improvement. Green transformers and enhanced cybersecurity in modern systems.	**(9)**
UnitV	**D.C. Machines** Overview of DC machines: classification (separately excited, series, shunt, compound) and industrial applications. Construction: armature, field winding, commutator, brushes, yoke. Principles and characteristics of DC generators. DC motors: types, speed-torque characteristics, and control	**(9)**

TextBooks	
1	" Principles of Electrical Machines" ,V.K. Mehta and Rohit Mehta, S. Chand & Company, 2012
2	"Principles of Electrical Machines",P.S. Bhimbhra, Khanna Publishers, 2023
3	"Electrical Machines", I.J. Nagrath and D.P. Kothari, McGraw-Hill Education, 2010

	ReferenceBooks
1	"Electrical Machines: Principles, Applications, and Control", P.C. Sen, Tata McGraw-Hill 3rd edition, 2013
2	"Transformer Engineering", S. K. Gupta, Dhanpat Rai & Co. ,2011

UsefulLinks
https://nptel.ac.in/courses/117/106/117106034
https://nptel.ac.in/courses/108108076/
https://nptel.ac.in/courses/108105062

	Course Outcomes	CL
BEE32402.1	**Analyze** the construction and performance of single-phase transformers.	4
BEE32402.2	**Evaluate** the principles and parameter calculation of three-phase transformers.	5
BEE32402.3	**Assess** transformer cooling, testing, and maintenance methods.	5
BEE32402.4	**Identify** and analyze special transformers and emerging technologies.	4
BEE32402.5	**Examine** the classification and characteristics of DC machines.	2

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road,Nagpur-441108
NAAC Accredited (A+ Grade)& NBA Accredited
An Autonomous Institute affiliated to RTMNU Nagpur

Second Year (Semester-IV)B. Tech. Electrical Engineering

BEE32403: Introduction to Power System

Teaching Scheme				Examination Scheme	
Lectures	3Hrs./week			**CT**	30Marks
Tutorial	0Hrs./week			**CA**	10Marks
Total Credit	3			**ESE**	60Marks
				Total	100Marks
				Duration of ESE:03Hrs.00Min.	

Course Objective:

1	To familiarize students with the basic components of power systems, including generators, transformers, transmission lines, distribution networks, and loads
2	To provide an understanding of the principles and techniques for efficient transmission and distribution of electrical energy.
3	To introduce the fundamentals of power system control, including voltage regulation, frequency control, and reactive power management.
4	To analyse performance of performance of short, medium and long transmission lines.
5	To equip students with methods to solve load flow problems and assess the stability and reliability of power systems.

Course Contents		Hours
UnitI	**Basic Concepts:** Structure of electrical power system, brief exposure to generation, transmission and distribution aspects, elementary consideration of economic bulk power supply system, use of high voltage general system consideration, idea about substation, concept of real, reactive and complex power. Load and their characteristics, voltage and frequency dependence of loads.	**(9)**
UnitII	**Power System Elements & Representation**: Representation of power system elements, models and parameters of generator, transformer and transmission lines, per unit system representation.single line impedance diagram, advantages of per unit representation.Derivation for Inductance of a single-phase line, concept of self GMD and mutual GMD,GMR	**(9)**
UnitIII	**Elementary distribution scheme:** Feeders and distributors. LT and HT cables,Dielectric stress in single core cables, Grading of cables. Introduction to distribution automation, Insulator & itstypes,string efficiency.Method to improve string efficiency	**(9)**
UnitIV	**Performance of Transmission line:**Classification of transmission line (short, medium (nominal T and nominal Π) and long), Characteristics (voltage regulation and efficiency) of transmission lines, determination of generalised (A,B,C,D) constants for transmission line, Ferranti effect, Surge Impedance Loading	**(9)**
UnitV	**Interconnection of system elements:**Interconnection of system elements to form two bus systems, Introduction of frequency and voltage as system state indicators. Concept of Voltage Stability, P-V and V-Q curves, Methods to improve voltage stability.	**(9)**

	Text Books
1	Modern Power System Analysis ,I. J. Nagrath, D. P. Kothari, 4th Edition, Tata McGraw Hill Publishing Co. Ltd., 2011
2	Electrical Power Systems, C.L. Wadhwa, 6th Edition New Age International, 2009
3	"Electrical Power Systems: Concepts, Theory, and Practice" Ashfaq Husain, 3rd Edition CBS Publishers & Distributors ,2014
	Reference Books
1	"Elements of Power System Analysis" William D. Stevenson Jr., 4th Edition ,McGraw Hill
2	"Power System Stability and Control" Prabha Kundur, McGraw Hill Education,1994

UsefulLinks
https://nptel.ac.in/courses/117/106/117106034/
https://nptel.ac.in/courses/108108076/
https://nptel.ac.in/courses/108105062/

	Course Outcomes	CL
BEE32403.1	**Describe** the basic concepts of electrical power system& functions of protective devices used in substation	3
BEE32403.2	**Determine** per unit values for power systemcomponents & line parameters of transmission line by using per unit system representation.	5
BEE32403.3	**Distinguish**feeders, distributors, insulators & HT LT cables based on their operating voltage levels.	4
BEE32403.4	**Calculate** the voltage regulation and efficiency of transmission lines by nominal PI method and nominal T method	3
BEE32403.5	**Interpret** P-V and V-Q characteristics to evaluate system performance	5

	Tulsiramji Gaikwad-Patil College of Engineering and Technology	
	Wardha Road, Nagpur-441108	
	NAAC Accredited (A+ Grade)& NBA Accredited	
	An Autonomous Institute affiliated to RTMNU Nagpur	

Second Year(Semester-IV)B. Tech. Electrical Engineering

Open Elective-II: BEE32404: Power Plant Engineering

Teaching Scheme			Examination Scheme	
Lectures	2Hrs./week		**CT-I**	07 Marks
			CT-II	07 Marks
Tutorial	--		**CA**	06 Marks
TotalCredit	2		**ESE**	30Marks
			Total	50Marks
			Duration of ESE:02Hrs.	

Course Objective:

1	To familiarize the students to the working of power plants based on different fuels.
2	To introduce the students the working of renewable energy sources.
3	To expose the student's different types of tariffs and the terms related to economic generation.

Coursecontents		Hours
UnitI	**Power Generation Method:** Introduction to typical layout of electrical power system, present power scenario in India, Generation of electrical power: non-renewable sources: Hydro station, Steam power plant, nuclear power plant and Gas turbine plant.	**(8)**
UnitII	**Economics of Generation:** Number and size of generator units. Base load and peak load plant. Cost of electrical energy-fixed cost, running cost.	**(8)**
UnitIII	**TariffandEconomicAspectinpowergeneration**:Different factors connected with generating station like connected load maximum demand, demand factor, load factor, diversity factor, plant capacity and utilization factor, load curve etc. Tariff: Flat rate tariff, two-part tariff, block rate tariff, maximum demand tariff.	**(8)**

Text Books

1	Power Plant Engineering / Arora,Domkundwar,6[th]Edition, Dhanpatrai Publications (P) Ltd., 2013
2	Generation of Electrical Energy: Dr. B.R. Gupta, publisher S. Chand, 7[th]edition2017
3	Power Plant Engineering: P.C. Sharma, Publisher: Kataria, S.K. & Sons , 2004
4	Non-conventional Energy sources by G.D. Rai. 4th edition khanna publishers 2010.

**Reference Books**

1	Elements of Power Station Design: M.V. Deshpande, edition: Reprint, publisher: PHI Learning Pvt. Ltd., 2009.
2	Chakraborty, Sony, Power System Engineering, 15th Edition, Dhanpatrai & Sons, 2002

Useful Links

1	NPTEL :: Mechanical Engineering - NOC:Power Plant Engineering
2	https://youtu.be/_HxM6DAYQ4U

	Course Outcomes	CL
BEE32404.1	**Analyze** the working and layout of Thermal power plants and the other systems comprising the plant.	4
BEE32404.2	**Analyze** the working and layout of Hydro power plantsand other systems comprising the plant.	4
BEE32404.3	**Describe** factors involved in economics of power plantoperation as well as understand and apply the concept of Tariff	3
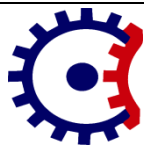
Second Year (Semester-IV) B. Tech. Electrical Engineering

BSH32404 : Leadership and Team Dynamics

Teaching Scheme			Examination Scheme	
Practical	**4Hrs/week**		CA	50 Marks
Tutorial	**-**		ESE	50 Marks
Total Credits	**2**		Total	100 Marks
			Duration of ESE: 2Hrs	

Course Objectives:

1.	**To provide** a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
2.	**To develop** an understanding of the interpersonal processes and group dynamics.
3.	**To provide** a theoretical understanding of leadership practices in organizations.

Course Contents

Unit I	**Introduction to Leadership & Team Management:** Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model, LMX Theory and Normative Decision Model; Situational Leadership Model; Contingency Model and Path Goal Theory; Emotional Approach Charismatic and Transformational Leadership; Leadership for Tomorrow
Unit II	**Leadership Attributes: Personality Traits and Leadership:** Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership, Power and Leadership: The art of influence in leadership: Leadership and "Doing the Right Things: Character-Based Approach to Leadership; Role of Ethics and Values in Organizational Leadership
Unit III	**Leadership Behaviour:** Leadership Pipeline, Assessing Leadership Behaviors: Multi-rater Feedback Instruments: The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management, Negotiation and Leadership, Leadership under a crisis situation: The Situation and the Environment: Culture and Leadership: Global Leadership.

Text Books

| T.1	Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett, R.C., &Curphy, G.J. (2019), 9th Edition, McGraw Hill Education, Chennai, India.
T.2	Robbins, S.P. Judge, T.A. & Vohra, N., "Organizational Behavior," 18th Ed, Pearson Education. (2019)

Reference Books

R.1	Baron R. A. and Byrne D., "Social Psychology", 10th Ed., Pearson Education, Inc. (2004)
R.2	Luthans F., "Organizational Behavior",10th Ed., McGraw-Hill Companies. (2004)

Course Code	Course Outcomes	CL	Class Sessions
BSH32404.1	Explain how global leadership skills contribute to leadership effectiveness.	2	10
BSH32404.2	Understand the leader's role in team-based organizations.	2	10
BSH32404.3	Classify the potential contribution of outdoor training to the development of team leadership.	2	10
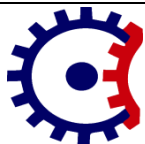
Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road,Nagpur-441108
NAAC Accredited (A+ Grade)
An Autonomous Institute affiliated to RTMNU Nagpur

Second Year(Semester-IV)B.Tech. Electrical Engineering

BEE32406:PLC Programming

Teaching Scheme			ExaminationScheme	
Lectures	-Hrs/week		**CT-1**	**-**
Practical	4Hrs/week		**CT-2**	-
TotalCredit	2		**ICA**	25
			ESE	25
			Total	50

	CourseOutcomes	CL
BEE32406.1	**Perform** types of PLC programming schemes	**4**
BEE32406.2	**Develop** rectify errors and download the ladder programs to control the motors using PLC	**6**
BEE32406.3	**Design** relay logic circuits to operate the motors.	**5**
BEE32406.4	**Demonstrate** PLC Interfacing with the controlled device.	**3**
BEE32406.5	**Construc**t power circuit and control circuits using appropriate components /devices	**5**
	Course Contents	
1.	To Study PLC field device interface modules (AI,AO,DI,DO modules)	
2.	To Implement Program for Logic Gates Function in PLC	
3.	Implementing Mathematical Operations in PLC.	
4.	Programming Jump-to-subroutine & return operations in PLC	
5.	To Control Traffic Light and Filling/Draining Control Operation.	
6.	To design a latter logic for Reversal of DC Motor Direction.	
7.	To Implement PLC based control of Level Process.	
8.	To demonstrate On-line Monitoring and Control of a Pilot plant using DCS.	
9.	To design PLC based Control of Flow Process.	
10.	Study of Foundation Field bus /IOT/Wireless HART Enabled Transmitter	
Text Books		
1	Robotics and Industrial Automation by R.K. Rajput, S. CHAND PUBLISHING, 2014	
2	Introduction to PLC by Gary Dunning, Cengage Learning, 3rd edition, 2005	
3	PLC, Principles and Applications by John W. Webb and Ronald A. Reis	
4	NITTTR PLC STTP Course Materials.	

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road,Nagpur-441108
NAAC Accredited (A+Grade)
An Autonomous Institute affiliated to RTMNU Nagpur
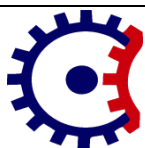
Second Year (Semester-IV)B.Tech. Electrical Engineering

BEE32406: AUTOCAD Electrical

Teaching Scheme			Examination Scheme	
Lectures	-Hrs/week		**CT-1**	**-**
Practical	4Hrs/week		**CT-2**	-
TotalCredit	2		**ICA**	25
			ESE	25
			Total	50
			Duration of ESE	2 Hrs.

	Course Outcomes	CL
BEE32406.1	Understand the terminology of electric circuit and electrical components	**2**
BEE32406.2	Identify and draw different components of electrical systems	**3**
BEE32406.3	Draw control and wiring diagrams.	**4**
BEE32406.4	Draw winding diagrams of electrical machines	**4**
BEE32406.5	Design simple control circuit on AutoCAD Electrical	**4**
	Course Contents	
1	To draw the Basic shapes like lines, arcs, curves, shape filling.	
2	To draw the Basic Electrical symbols.	
3	To draw house wiring diagram and layout.	
4	To draw the Electrical machine winding diagram.	
5	To draw Transmission tower.	
6	To draw construction feature of D.C motor.	
7	To draw 3 point and 4 point D.C starters.	
8	To draw lamps used in illumination.	
9	To draw single line diagram of power system.	
10	To draw Simple power and control circuit diagrams.	

Text Books

1	**AutoCAD Electrical 2025 Black Book**: Written by Gaurav Verma, this book is the 10th edition and was published in May 2024.
2	**AutoCAD Electrical 2024 Black Book: 9th Edition**: Written by Gaurav Verma, this book was published in May 2023.

Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441108
NAAC Accredited (A+Grade)
An Autonomous Institute affiliated to RTMNU Nagpur

Second Year (Semester-IV)B. Tech. Electrical Engineering

BEE32406: MATLAB

Teaching Scheme				Examination Scheme	
Lectures	-Hrs/week			**CT-1**	**-**
Practical	4Hrs/week			**CT-2**	-
Total Credit	2			**ICA**	25
				ESE	25
				Total	50
				Duration of ESE	2 Hrs.

	CourseOutcomes	CL
BEE32406.1	**Understand** the basics operation of MATLAB.	**2**
BEE32406.2	**Analysis** the time domain and frequency domain signals.	**4**
BEE32406.3	**Implement** the concept of Fourier series and Fourier transforms.	**3**
BEE32406.4	**Determine** cross correlation, autocorrelation of sequence & impulse response, step response of a system.	**3**
BEE32406.5	**Design** frequency response of the system.	**6**
	CourseContents	
1	Introduction to MATLAB: To define & use variables, vectors, Matrices & its functions in MATLAB. To study various arithmetic operators and mathematical functions in MATLAB. To create & use m-files	
2	Basic plotting of signals: To study various MATLAB commands for creating two- and three-dimensional plots. Write a MATLAB program to plot the following continuous time and discrete• time Signals. .i. Step Function ii. Impulse Function iii. Exponential Function iv. Ramp Function v. Sine Function	
3	Write a MATLAB program to obtain linear convolution of the given sequences.	
4	Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.	
5	Write a MATLAB program to obtain Cross correlation of sequence x(n) and y(n) & autocorrelation of a sequence x (n) of the given sequences & verify the property.	
6	Write a MATLAB program to generate Fourier series of a Square Wave.	
7	Write a MATLAB program to Calculate and plot using MATLAB Fourier Transform and Z-Transform of a given signal.	
8	Write a MATLAB program to find the impulse response and step response of a system from its difference equation. Compute and plot the response of a given system to a given input.	
9	Write a MATLAB program to plot magnitude and phase response of a given system.	
10	Checking linearity/non-linearity of a system using SIMULINK Build a system that amplifies a sine wave by a factor of two.	
TextBooks		
1	**Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers**: By Rudra Pratap, published by Oxford University Press	
2	**Essentials of MATLAB Programming, 2e**: By Stephen J. Chapman, published by Cengage Learning	

	Tulsiramji Gaikwad-Patil College of Engineeringand Technology	
	Wardha Road,Nagpur-441108	
	NAAC Accredited (A+ Grade)& NBA Accredited An	
	Autonomous Institute affiliated to RTMNU Nagpur	

Second Year (Semester-IV)B.Tech. Electrical Engineering
BEE32407:Transformer and DC Machine Lab

Teaching Scheme				Examination Scheme	
Practical	2Hrs/week			**CA**	25Marks
Total Credit	1			**ESE**	25Marks
				Total	50Marks
				Duration of ESE:02Hrs. 00 Min.	

Course Outcomes(CO)
Students will be able to
1 **Analyze** the regulation and efficiency of a single-phase transformer
2 **Demonstrate** the ability to perform polarity tests and execute parallel operation of single-phase transformers
3 **Conduct** phasing-out tests on three-phase transformers and configure autotransformers in step-up and step-down modes
4 **Analyze** transformer voltage regulation using MATLAB and assess IoT-based monitoring systems**.**
5 **Perform** brake test on a DC shunt motor and analyze magnetization characteristics of a DC shunt generator

Sr.No.	List of Experiment	CO
1	Determine regulation and efficiency of single-phase transformer by direct loading	**CO1**
2	Calculate open-circuit and short-circuit tests on a single-phase	**CO2**
3	Perform polarity test on a single-phase transformer whose polarity	**CO2**
4	Perform parallel operation of two single-phase transformers and, (i) Determine the load current sharing (ii) Determine the apparent and real power sharing	**CO3**
5	Perform phasing-out test on a three-phase transformer	**CO3**
6	To connect the autotransformer in step-up and step-down modes noting the input and output readings	**CO4**
7	Simulate the voltage regulation of a transformer under varying load conditions in MATLAB, and analyze how load variations affect the output voltage	**CO4**
8	Examine an IoT-based transformer protection system to monitor parameters like temperature, voltage, and current	**CO4**
9	Perform brake test on a dc shunt motor.	**CO5**
10	Obtain magnetization characteristics of a D.C. shunt generator	**CO5**

Text Books
1 Sanjay B. Bodkhe, Electric Motors and Transformers Theory and Practicals, (AICTE) 2024
2 V.K. Mehta and Rohit Mehta, "Electrical Machines," S. Chand & Company, 2012
3 P.S. Bhimbhra, "Principles of Electrical Machines," Khanna Publishers, 2011

Reference Books
1 P.C. Sen, "Electrical Machines: Principles, Applications, and Control," Tata McGraw-Hill
2 S. K. Gupta, "Transformer Engineering," Dhanpat Rai & Co, 2011

Useful Links
1 https://nptel.ac.in/courses/117/106/117106034
2 https://nptel.ac.in/courses/108108076/

	Tulsiramji Gaikwad-Patil College of Engineering and Technology	
	Wardha Road,Nagpur-441108	
	NAAC Accredited (A+ Grade) & NBA Accredited	
	An Autonomous Institute affiliated to RTMNU Nagpur	

Second Year (Semester-IV)B. Tech. Electrical Engineering

BCE32408: Sustainable Development Goals

Teaching Scheme			Examination Scheme	
Lectures	2Hrs./week		**CT**	15 Marks
Tutorial	-Hrs./week		**CA**	05 Marks
TotalCredit	2		**ESE**	30 Marks
			Total	50Marks
			Duration of ESE:02Hrs.	

Course Objective:

1	To develop a comprehensive understanding of the UN Sustainable Development Goals (SDGs) and their interconnections.
2	To analyze the global challenges addressed by the SDGs and their impact on various sectors.
3	To explore innovative solutions and best practices for implementing the SDGs.
4	To evaluate the progress made towards achieving the SDGs at national and international levels.
5	To foster a sense of global citizenship and social responsibility among students.

Course Contents		Hours
UnitI	**Introduction to Sustainable Development Goals (SDGs):** Definition of Sustainability, Aspects of sustainability, historical perspective of sustainable development, Climate Change Conferences and Summits, the Brundtland Commission Report, transition from Millennium Development Goals (MDGs) to SDGs, the role of UN and the need for SDGs and Adoption by the World, scope and inclusion of the 2030 Agenda for Sustainable Development.	**(8)**
UnitII	**Framework & Structuring of the 17 SDGs:** SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-being, SDG 4: Quality Education, SDG 5: Gender Equality, SDG 6: Clean Water and Sanitation, SDG 7: Affordable and Clean Energy, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 10: Reduced Inequalities, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life below Water, SDG 15: Life on Land, SDG 16: Peace, Justice and Strong Institutions, SDG 17: Partnerships for the Goal	**(8)**
UnitIII	**SDGs Implementation and Future Perspectives:** Interconnections between the SDGs, the role of technology and innovation in SDG implementation, financing the SDGs, measuring SDG progress, future challenges and opportunities, Climate change and its impact on sustainable development, Case studies of successful SDG implementation – India, World	**(8)**

TextBooks

1	Hazra, Somnath., Bhukta, Anindya (2020) Sustainable Development Goals An Indian Perspective, Springer International Publishing, Switzerland
2	Ziai, Aram (2016) Development Discourse and Global History from colonialism to the sustainable development goals. Routledge, London & New York

ReferenceBooks

1	Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2020. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.
2	OECD (2019), Sustainable Results in Development: Using the SDGs for Shared Results and Impact, OECD Publishing, Paris, https://doi.org/10.1787/368cf8b4-en.

UsefulLinks

https://nptel.ac.in/courses/109106200

https://www.un.org/sustainabledevelopment/

	Course Outcomes	**CL**
BCE32408.1	To explore the historical origins and evolution of the UN-SDGs.	4
BCE32408.2	To analyze the 17 SDGs and their interlinkages.	4
BCE32408.3	To analyze the role of technology and innovation in achieving the SDGs along with future challenges and opportunities.	4

	Tulsiramji Gaikwad-Patil College of Engineering and Technology	
	Wardha Road,Nagpur-441108	
	NAAC Accredited (A+ Grade)& NBA Accredited	
	An Autonomous Institute affiliated to RTMNU Nagpur	

Second Year (Semester-IV)B. Tech. Electrical Engineering

BBA32409: Managerial Economics

TeachingScheme				**Examination Scheme**	
Lectures	2Hrs./week			**CT**	15 Marks
Tutorial	-Hrs./week			**CA**	05 Marks
Total Credit	2			**ESE**	30 Marks
				Total	50Marks
				Duration of ESE: 02Hrs.	

Course Objective:

1	To understand concepts and principles of managerial economics
2	To understand market the concepts of Demand and Supply
3	To understand market the concepts of Production Function and Cost Analysis

Course Contents		**Hours**
UnitI	Nature & Scope of Managerial Economics: Including introduction, meaning, fundamental concepts, opportunity cost, discounting principle, incremental reasoning, etc.	**(8)**
UnitII	Demand & Supply analysis: Covering market demand/supply, consumer behavior, utility maximization, demand forecasting, etc.	**(8)**
UnitIII	Production Function & Cost Analysis: Including laws of diminishing returns, economies of scale, Cobb Douglas functions, cost analysis, etc.	**(8)**

TextBooks

1	Managerial Economics, Suma Damodran, 2006, Oxford University Press, New Delhi
2	Indian Economy, Mishra &Puri, 2007, Himalaya Publishing House
3	Managerial Economics, Peterson & Levis, Prentice Hall of India

ReferenceBooks

1	Managerial Economics, P. L. Mehta, Sultan Chand & Sons, New Delhi
2	Managerial Economics, D.N Dwivedi, Vikas Publishing House Pvt. Ltd.

UsefulLinks

https://archive.nptel.ac.in/courses/110/101/110101149/

https://www.youtube.com/watch?v=yLFpF0bunvs

	Course Outcomes	**CL**
BBA32409.1	Recognize the knowledge on concepts and principles of ManagerialEconomics.	2
BBA32409.2	Describe and relate to the market the concepts of Demand and Supply.	2
BBA32409.3	Identify and recognize the Production Function concept and Cost Analysis.	2

	Tulsiramji Gaikwad-Patil College of Engineering and Technology	
	Wardha Road,Nagpur-441108	
	NAAC Accredited (A+ Grade) & NBA Accredited	
	An Autonomous Institute affiliated to RTMNUNagpur	

Second Year (Semester-IV)B. Tech. Electrical Engineering
BCS32411:Python CodingLab

Teaching Scheme				ExaminationScheme	
Practical	4Hrs/week			**CA**	25Marks
Total Credit	2			**ESE**	25Marks
				Total	50Marks
				Duration of ESE:02Hrs.00Min.	

CourseObjective	
1	Demonstrate the use of various Python data types (such as integers, strings, lists, tuples, etc.) and operators (arithmetic, logical, comparison) to build simple programs that solve real-world problems.
2	Utilize conditional statements (if, else, elseif) and looping structures (for, while) to control the flow of execution in programs and solve real-life challenges through logical decision-making.
3	Differentiate between mutable (lists, dictionaries, sets) and immutable (tuples, strings) data structures in Python and apply them appropriately in problem-solving contexts.
4	Demonstrate the principles of object-oriented programming, such as classes, objects, inheritance, polymorphism, and encapsulation, to design and solve complex problems using functions and methods.
5	Develop programs that incorporate arrays and data structures, and apply file handling techniques to read from, write to, and manage external files for effective data storage and retrieval.

Sr.No.	List of Experiment	CO
1	Write a Program in Python to take input from user using input method andtypecast into integer value using int ( ) method to find: i) Addition ofthe two numbers ii) Subtraction of two numbers iii) Division of two numbers iv) Multiplication of two numbers v) Modulus of two numbers vi) Exponential power of two numbers	CO1
2	Make of the operators in Python to execute the following: i) Python interpreter as Calculator (simple arithmetic operations) ii) Swapping oftwo numbers iii) convert number in binary, octal and hexadecimal system to decimalnumber system	CO1
3	Use the relational operators to execute the decision making using if, if- else, if--else- if ladder: i) Print a number as Even number ii) Print a number as Even / Odd Number iii) Number is divisible by more than two numbers	CO2
4	Demonstrate the use of loop control statement using while, for i) Print a multiplication table from 2 to 10 ii) Print squared value numbers ranging from 1 to 10	CO2
5	Using tuples perform the following items in the data structure: i) Delete an item from a tuple ii) Assess an item in tuple iii) assess range of values in a tuple iv) reversing items in the tuple	CO4
6	Using list data structure performs the operations of append, insert, extend and modify the items in the data structure.	CO3

7	Using dictionary data structure perform the following operations on the items of the data structure: i) Accessing elements of dictionary using key name ii) Printing elements of dictionary using its name iii) Assigning a key that does not exists iv) Add a new entry v) Changing elements in a dictionary vi)Deleting elements from a dictionary	CO3
8	Find the factorial of a range of numbers input by the user using user defined function.	CO4
9	Use the math function in Python to find: i) maximum and minimum out of the list ii) sum and average of numbers in a list iii) calculate average using mean method in statistics library iv) Round a number to a given precision in decimal digits	CO4
10	A Python program to store students marks into an array and finding total marks and percentage of marks	CO5
11	Use pandas to work on relational and labelled data from websites using csvfiles.	CO5

TextBooks

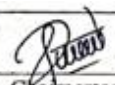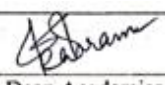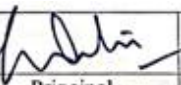| 1	Programming And Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill, 2018.
2	Let Us Python, Yashwant Kanetkar and Aditya Kanetkar, 2nd Edition, bpb Press,2020
3	Python Crash Course, 2Nd Edition: A Hands-On, Project-Based Introduction to Programming, Eric Matthes, No Starch Press,20l6

ReferenceBooks

1	Mark Lutz, Programming Python, O'Reilly, 4th Edition, 2010
2	Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford HigherEducation,20l8
3	Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016

UsefulLinks

1	https://onlinecourses.nptel.ac.in/noc22_cs32ipreview
2	https://nptcl.ac.in/courses/106106145

	Course Outcomes	**CL**
BCS32411.1	Demonstrate the use of data types and operators in Python to build simple programs to solve the specified tasks by the user.	4
BCS32411.2	Make use of decision making and control statement in Python toexecute the real-life problems.	3
BCS32411.3	Demonstrate the mutable and immutable data structures in PythonProgramming.	4
BCS32411.4	Solve the problems by using object-oriented programmingconcepts by using functions.	3
BCS32411.5	Design the programs by using arrays, data and file handling inPython.	6