DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
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Course Structure and Detailed Syllabus

National Education Policy (NEP) 2020 for the session 2024-25

For

Second Year B. Tech. Electrical Engineering

(For University Department only)

With effect from the Academic Year 2024-2025

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE.

B. Tech Electrical Engineering

A. Program Educational Objectives (PEOs)

Graduates will able to–

1. To equip graduates with a strong foundation in engineering sciences and Electrical Engineering fundamentals to become effective collaborators, researchers and real-time problem solver with technical competencies.

2. Perceive the limitation and impact of engineering solutions in social, legal, environmental, economic and multidisciplinary contexts.

3. Excel in Industry/technical profession, higher studies, and entrepreneurship exhibiting global competitiveness.

B. Program Outcomes (POs)

Engineering Graduate will be able to –

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

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the

consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Program Specific Outcomes (PSO)

Electrical Engineering graduates will specifically be able to do in their field.

1. Demonstrate the ability to apply fundamental knowledge of mathematics, science and engineering to identify, formulate, analyze, investigate, and design complex problems in the field of electrical engineering.

2. Demonstrate ability to apply the appropriate techniques and modern engineering tools to manage and solve complex electrical engineering projects, adapt in multi-disciplinary environments, and engage in lifelong learning.

3. Able to propose & implement engineering solutions in the context of the environment, society, economy, and professional ethics and have good communication skills

B. Tech Second Year Electrical Engineering

SEMESTER III											
Sr. No.	Course Code	Course Title	Teaching Scheme			Marking Scheme			Total Marks	CR	Category
			L	T	P	CA	MSE	ESE			
1	24UD1000BS301	Engineering Mathematics -III	3	0	0	20	20	60	100	3	BSC
2	24UD1293PC302	Electrical and Electronics Measurements	3	0	0	20	20	60	100	3	PCC
3	24UD1293PC303	Power System	3	0	0	20	20	60	100	3	PCC
4	24UD1293PC304L	Electrical and Electronics Measurements Lab	0	0	2	60		40	100	1	PCC
5	24UD1000OE305	Open Elective I	2	0	0	20	20	60	100	2	OE
6	24UD1293MD306	**MDM Bucket***	2	0	0	20	20	60	100	2	MDM
7	24UD1000HM307B	Innovation and Entrepreneurship	2	0	0	20	20	60	100	2	HSSM
8	24UD1000VE308	Life of Chhatrapati Shivaji Maharaj	1	0	0	50			50	1	VEC
9	24UD1293PC309L	Power System Lab	0	0	2	60		40	100	1	PCC
10	24UD1000VE310	Universal Human value-II	3	0	0	20	20	60	100	3	VEC
11	24U1293CP311	Mini project / Field Project	0	0	4	60		40	100	2	CEP
		Total	**19**	**0**	**8**				**1050**	**23**	

NOTE: * Refer to Multidisciplinary Minor Bucket

BSC/ESC: *Basic Science Course/ Engineering Science Course,* ***PCC:*** *Programme Core Course* ***PEC:*** *Programme Elective Course,* ***Multidisciplinary (OE):*** *Open Elective Other than particular programme,* ***VSEC:*** *Vocational and Skill Enhancement Course,* ***HSSM:*** *Humanities Social Science and Management,* ***IKS:*** *Indian Knowledge System, HSSM- VEC: Value Education Course,* ***CCA:*** *Co-curricular & Extracurricular Activities* ***NPTEL Course: Online NPTEL Course***

SEMESTER IV											
Sr. No.	Course Code	Course Title	Teaching Scheme			Marking Scheme			Total Marks	CR	Category
			L	T	P	CA	MSE	ESE			
1	24UD1293PC401	Power System Analysis	3	0	0	20	20	60	100	3	PCC
2	24UD1293PC402	Network Theory	3	0	0	20	20	60	100	3	PCC
3	24UD1293PC403	Electrical Machine I	3	0	0	20	20	60	100	3	PCC
4	24UD1293VS404	Electrical Installation and Estimation	2	0	0	20	20	60	100	2	VSEM
5	24UD1293OE405	Open Elective II	3	0	0	20	20	60	100	3	OE
6	24UD1293MD406	**MDM Bucket***	2	0	0	20	20	60	100	2	MDM
7	24UD1293PC407L	Network Theory Lab	0	0	2	60		40	100	1	PCC
8	24UD1293PC408L	Electrical Machine I Lab	0	0	2	60		40	100	1	PCC
9	24UD1293PC409L	Power System Analysis Lab	0	0	2	60		40	100	1	PCC
10	24UD1000IK410	Marathi/Hindi/Sanskrit/ Gujrati/Kannada/Pali	2	0	0	20	20	60	100	2	HSSM
11	24UD1000HM411A	Patents and IPR	2	0	0	20	20	60	100	2	Entrepreneurship
12	24UD1000VE412	Constitution of India	2	0	0	50		50	100	AU	VEC
13	24UD1000VE413	Life of Bharatratna Dr. Babasaheb Ambedkar	1	0	0	50			50	1	VEC
		Total	**23**	**0**	**6**				**1250**	**24**	

NOTE: * Refer to Multidisciplinary Minor Bucket

BSC/ESC: *Basic Science Course/ Engineering Science Course,* ***PCC:*** *Programme Core Course* ***PEC:*** *Programme Elective Course,* ***Multidisciplinary (OE):*** *Open Elective Other than particular programme,* ***VSEC:*** *Vocational and Skill Enhancement Course,* ***HSSM:*** *Humanities Social Science and Management,* ***IKS:*** *Indian Knowledge System, HSSM- VEC: Value Education Course,* ***CCA:*** *Co-curricular & Extracurricular Activities* ***NPTEL Course: Online NPTEL Course***

Semester III

24UD1000BS301 **Engineering Mathematics -III**

Teaching Scheme	**Examination Scheme**
Lectures Theory: 03 Hr / Week Credit:03	Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objectives:

1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
2. To understand and study the Physics principles behind the developments of engineering materials.

Course Outcome:

After completion of this course, students will be able to:

CO1. Solve higher order linear differential equations using appropriate techniques for modelling and analyzing electrical circuits.

CO2. Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.

CO3. Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.

CO4. Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields.

CO5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

Unit	Contents	Hrs.
1	**Laplace Transform** Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.	**6**
2	**Inverse Laplace Transform** Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.	**6**
3	**Fourier Transform** Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.	**6**

4	**Partial Differential Equations and Their Applications** Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation (), and one dimensional wave equation.	**6**
5	**Functions of Complex Variables** Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form ;Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).	**6**
	Text Books: 1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi. 2. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi. 3. A course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai. 4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi. ***Reference Books:*** 1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork. 2. A Text Book of Engineering Mathematics by PeterO"Neil, Thomson Asia Pte Ltd., Singapore. 3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi. 4. Integral Transforms and their Engineering Applications by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai. 5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill , NewYork.	

24UD1293PC302	**Electrical and Electronics Measurements**
Teaching Scheme Lectures Theory: 03 Hr / Week Credit:03	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objectives:

1. To understand the principles, construction, and applications of various analog and digital measuring instruments used in electrical engineering.
2. To apply methods for measuring electrical parameters such as current, voltage, power, and energy in single-phase and three-phase systems, with a focus on accuracy and error analysis
3. To gain proficiency in the use and analysis of DC and AC electrical bridges for the measurement of resistance, inductance, and capacitance.
4. To explore the working principles, construction, and applications of transducers and sensors used in industrial and automation systems.

Course Outcome:

After completion of this course, students will be able to:

CO1. define and explain key measurement concepts like accuracy, sensitivity, and reproducibility, and their impact on electrical measurements.

CO2. Competence in analyzing and using analog instruments, such as ammeters, voltmeters, and wattmeters, for accurate current, voltage, and power measurements.

CO3. Proficiency in using electrical bridges (DC and AC) for resistance, inductance, and capacitance measurement, with understanding of each method's limitations.

CO4. explain the construction, functioning, and error characteristics of instrument transformers and their applications in high-voltage systems.

CO5. Skill in operating digital and electronic measurement instruments, including CRO, DSO, and digital energy meters, and applying them to real-world scenarios like power monitoring and AMR systems.

Unit	Contents	Hrs.
1	**Introduction:** Definitions- Accuracy, tolerance, sensitivity, reproducibility, absolute and secondary measuring instruments, recording instruments. **Analog Ammeters and Voltmeters:** Permanent magnet Moving Coil (PMMC) & Moving Iron (MI) instruments: construction, torque equation range extension, effect of temperature, classification, errors, advantages, and disadvantages. (numerical)	7
2	**Analog Wattmeter and Power Factor Meters:** Electrodynamometer type: wattmeter & power factor meter: construction, working, torque equation, advantages and disadvantages; Measurement of active and reactive power in single phase and in three phase with balanced loads. (numerical) **Analog Energy Meter:** Single phase induction type energy meters, construction, working, lag adjustments, errors; Maximum demand indicators.	7

3	**Electrical Bridges:** **DC bridges**: Wheatstone, Kelvin's, Kelvin's double bridge, Megger, Earth resistance measurement, loss of charge method for measurement of high resistance**;** **AC bridges:** Maxwell's bridges, De-Sauty, Anderson, Schering, Wien; for measurement of inductance and capacitance and their limitations. (numerical)	**6**
4	**Instrument Transformers:** Construction, working, ratio error and phase errors, testing & applications of current transformer and potential transformer. **Transducers:** Thermistor, RTD, thermocouple, LVDT, strain gauge, piezoelectric transducers, digital shaft encoders, tachometer, Hall Effect sensors.	**6**
5	**Electronic Instruments:** Digital voltmeters, Dual trace and dual beam Cathode Ray Oscilloscopes (CRO), measurement of voltage and frequency, Lissajous patterns, Digital Storage Oscilloscope – sampling of waveforms for understanding the functioning of DSO wave analyzers, harmonic distortion analyzer, LCR meter and Q-meter	**6**
6	**Smart Energy Meter:** Digital energy meter design components; circuit diagram; Digital meter software algorithm; meter working principle; Automatic Meter Reading (AMR).	**5**
	Reference Books: 1. Electrical Measurements and Measuring Instruments, E.W. Golding, F.C. Widdis, Reem Publications,2011. 2. Electronic Instrumentation and Measurements, H S Kalsi, McGraw Hill, Fourth Edition, 2019 3. Introduction to Measurements and Instrumentation, Arun K. Ghosh, Fourth Edition, Eastern Economy Edition, PHI Learning, 2012. 4. Dr. Shashikant Bakre, Electricity Metering in Easy Steps: An outline book on smart energy meters for everyone, 2015. 5. Ndinechi, M. C., O. A. Ogungbenro, and K. C. Okafor. "Digital metering system: a better alternative for electromechanical energy meter in Nigeria." International Journal of Academic Research 3.5 (2011): 189-192. 6.Sawhney A. K., Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai &Co.,2015	

24UD1293PC303	**Power System**
Teaching Scheme Lectures Theory: 03 Hr / Week Credit:03	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objectives:

1. To understand the evolution, structure, and layout of electrical power systems, including various power generation sources and their operational principles.
2. To analyze variable load conditions on power stations and understand load curves, diversity factors, and selection criteria for base and peak load generating units.
3. To learn the electrical and mechanical design principles of overhead transmission lines, including inductance, capacitance, corona effects, and the choice of conductor materials.
4. To explore AC and DC distribution systems, focusing on design considerations, load calculations, and efficient power distribution strategies

Course Outcome:

After completion of this course, students will be able to:

CO1. Ability to understand and explain the construction and working principles of different types of power plants, including thermal, hydro, and nuclear, and their role in power systems.

CO2. Proficiency in analyzing load characteristics, load curves, and key factors for optimal selection and operation of generating units under variable load conditions.

CO3. Capability to calculate the electrical parameters of transmission lines, such as inductance and capacitance, and understand concepts like GMD, GMR, and corona effects online performance.

CO4. Competence in mechanical design considerations for overhead transmission lines, including conductor selection, insulator types, and sag calculation under varying support and environmental conditions.

CO5. Understanding of AC and DC distribution systems, including system classifications, load balancing, distribution calculations, and design considerations

Unit	Contents	Hrs.
1	**Electrical Power Generation:** Evolution of Power Systems, Typical Layout of an Electrical Power System– Introduction to different sources of energy. Construction and working of thermal power plants, Hydro power station, Nuclear Power Plant with neat block diagram of major parts. Descriptive treatment of alternator exciter & excitation systems, major electrical equipment's in generating stations.	**6**
2	**Variable Load on Power Stations:** Structure of Electric Power System, Load Curves, Important Terms and Factors, Units Generated per Annum, Load Duration Curve, Types of Loads, Typical Demand and Diversity Factors, Load Curves and Selection of Generating Units, Important Points in the Selection of Units, Base Load and Peak Load on Power Station.	**6**

3	**Electrical Design of Overhead Transmission Lines :** Line conductors, inductance, and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, concept of GMD and GMR, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance. Skin effect, proximity effect, Ferranti Effect. Corona: Introduction, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, Numerical.	**6**
4	**Mechanical Design of Transmission Lines:** Types of conductors, Choice of conductor materials, Stranded copper & ACSR conductor, Insulation consideration, Different types of insulator, supports, distribution of voltage across the insulator string, String efficiency, Effect of wind & ice coating on transmission line, sag due to equal & unequal supports, with their derivation, Numerical.	**6**
5	**Performance of Transmission Lines:** Classification of overhead transmission lines, performance of single phase short transmission lines, three phase short transmission lines, effect of load power factor on regulation and efficiency, different types of medium transmission line, Analysis of long transmission lines, generalized constant of transmission line, determination of generalized constant of transmission lines, percentage regulation, Transmission efficiency, numerical based on above.	**6**
6	**AC & DC Distribution:** Classification of Distribution system, Requirement of distribution system, design consideration in distribution system. AC Distribution: Calculations, method of Solving AC Distribution problem, three phase unbalanced load, four wire unbalanced star connected load, ground detector, DC Distribution: types, DC distribution calculation, and three wire DC system.	**6**
	Reference Books: 1. Gupta B. R. " Power Plant Engineering".(Eurasia publications) 2. Nag P. K. " Power Plant Engineering",(Tata McGraw Hill Publications) 3. Kothari Nagrath, "Electric Power System", (Tata McGraw Hill Publications) 4. Wadhva S. L.,"Electric Power System",(Tata McGraw Hill Publications) 5. Stevension W. B., "Power System", (English Language Book Society publications)	

24UD1000HM307B	**Innovation and Entrepreneurship**
Teaching Scheme Lectures Theory: 02 Hr / Week Credit:02	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. To cultivate an entrepreneurial mindset and leadership qualities through real-world simulations, role-play, and industry case studies.
2. To develop skills in problem and customer identification using design thinking principles, market analysis, and trend assessment.
3. To gain proficiency in solution design, prototyping, and iteration to create a strong value proposition and align solutions with customer needs.
4. To understand and apply foundational business models, financial planning, and go-to-market strategies, including lean canvas and startup funding options.

Course Outcome:

After completion of this course, students will be able to:

CO1. Develop entrepreneurial mind-set and attributes

CO2. Apply process of problem-opportunity identification and feasibility assessment through developing a macro perspective of the real market, industries, domains and customers

CO3. Analyse Customer and Market segmentation, estimate Market size.

CO4. Initiate Solution design, Prototype for Proof of Concept. Understand MVP development and validation techniques to determine Product-Market fit.

CO5. Craft initial Business and Revenue models, financial planning and pricing strategy for profitability and financial feasibility of a venture.

Unit	Contents	Hrs.
1	**Entrepreneurship Fundamentals & Context** Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. Gamified role play based exploration aligned to one's short term career aspiration and ambition. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus. Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity	6
2	**Problem & Customer Identification** Understanding and analysing the macro Problem and Industry perspective, technological, socio-economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity. Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.	6
3	**Solution design & Prototyping** Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding	6

	prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. Core Teaching Tool: Venture Activity, nocode Innovation tools, Class activity	
4	**Opportunity Assessment and Sizing** Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity. Core Teaching Tool: Class and Venture Activity	**6**
5	Business & Financial Model, Go-to-Market Plan Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build -Measure – Lean approach Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance. Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options. Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities	**6**
	Reference Books 01. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition. 02. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business. 03. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons 04. Chowdhry Ajay, (2023) Just Aspire: Notes on Technology, Entrepreneurship and the Future. 05. Simon Sinek (2011) Start With Why, Penguin Books limited 06. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business 07. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited 08. Collins Jim, Porras Jerry, (2004) Built to Last: Successful Habits of Visionary Companies 09. Burlington Bo, (2016) Small Giants: Companies That Choose to Be Great Instead of Big 10. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd	

24UD1293PC304L	**Electrical and Electronics Measurement Lab**	
Teaching Scheme Practical: 02 Hr / Week Credit:01		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks
Unit	**Contents**	**Hrs.**
1	Extension of range of ammeter/voltmeter using shunt/series resistance and calibration of the meter using standard ammeter/voltmeter.	**2**
2	Measurement of low/medium resistance using Kelvin's double bridge and Wheatstone's bridge.	**2**
3	Measurement of inductance and capacitance using Maxwell bridges.	**2**
4	Measurement of inductance using Anderson bridge.	**2**
5	Measurement of capacitance using Schering bridge.	**2**
6	Measurement of temperature using RTD and thermistor	**2**
7	Measurement of pressure and weight using piezoelectric transducer.	**2**
8	Measurement of displacement using LVDT & RVDT.	**2**
9	Measurement of active power in a balanced three phase system using two wattmeter method.	**2**
10	Measurement of reactive power in a balanced three phase system using single wattmeter method.	**2**
11	Determination of hysteresis loop of an iron ring specimen using DSO/CRO.	**2**
12	Calibration of single – phase energy meter by direct loading and phantom loading at various power factors.	**2**
	References: 1. Golding E.W, Electrical Measurements & Measuring Instruments, 5th ed. Reem publications, 2009. 2. Cotton. H, Advanced Electrical Technology, Wheeler Publications, 2011. 3. Suresh Kumar K.S Electric Circuit and Networks, Pearson education, 2009. 4. Cooper W.D, Modern Electronics Instrumentation, Prentice Hall of India, 1986	

24UD1293PC309L	**Power System Lab**	
Teaching Scheme Practical: 02 Hr / Week Credit:01		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Unit	Contents	Hrs.
1	Study of thermal power plant layout and its components	2
2	Study of Hydropower plant layout and its components	2
3	Study of Nuclear power plant with detail components	2
4	Study of different OHT System conductors	2
5	Study of different OHT System insulator	2
6	Study of alternator exciter systems	2
7	Determination of performance parameter of medium transmission line	2
8	Determination of performance parameter of long transmission line	2
9	Determination of ABCD parameters of transmission line	2

24UD1000VE310	**Universal Human Value-II**
Teaching Scheme Lectures Theory: 03 Hr / Week Credit:03	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. To understand the concept of value education and explore self-awareness as a foundation for continuous happiness and prosperity.
2. To promote harmony within oneself and between the self and the body, fostering self-regulation and holistic well-being.
3. To develop an understanding of harmonious relationships in the family and society, based on trust, respect, and universal values.
4. To gain insight into the interconnectedness and mutual fulfillment in nature, fostering a holistic perception of existence and ethical professional practices.

Course Outcome:

After completion of this course, students will be able to:

CO1. Students will demonstrate an understanding of value education and its role in achieving happiness, prosperity, and self-exploration.

CO2. Students will be able to differentiate between the needs of the self and the body and develop strategies for achieving harmony and self-regulation.

CO3. Students will understand the importance of trust, respect, and values in human relationships, fostering harmony within the family and society.

CO4. Students will recognize the interconnectedness of nature, society, and existence, promoting a holistic approach to life and mutual fulfillment.

CO5. Students will apply ethical principles in professional settings, utilizing humanistic education and strategies for transitioning to a value-based life and profession.

Unit	Contents	Hrs.
1	**Introduction to Value Education** - Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario - Method to Fulfil the Basic Human Aspirations	7
2	**Harmony in the Human Being** - Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self - Harmony of the Self with the Body - Programme to Ensure self-regulation and Health	7

3	**Harmony in the Family and Society** - Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship - 'Trust' – the Foundational Value in Relationship - 'Respect' – as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order	7
4	**Harmony in the Nature (Existence)** - Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence	7
5	**Implications of the Holistic Understanding – a Look at Professional Ethics** - Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Competence in Professional Ethics - Holistic Technologies, Production Systems and Management Models-Typical Case Studies - Strategies for Transition towards Value-based Life and Profession	7
	Text Book and Teachers Manual: a. The Textbook *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 b. The Teacher's Manual Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 **3.2 Reference Books** 1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi 5. Small is Beautiful - E. F Schumacher. 6. Slow is Beautiful - Cecile Andrews 7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - by Dharampal 10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi 11. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English) Gandhi - Romain Rolland (English	

Semester IV

24UD1293PC401 **Power System Analysis**

Teaching Scheme	**Examination Scheme**
Lectures Theory: 03 Hr / Week Credit:03	Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. Understand and apply power system modeling principles, including complex power flow and per-unit representation.
2. Analyze load flow studies using iterative techniques like Gauss-Seidel and Newton-Raphson methods.
3. Conduct fault analysis in power systems, covering symmetrical and unsymmetrical fault conditions.
4. Evaluate power system security, including contingency analysis and power quality management techniques.

Course Outcome:

After completion of this course, students will be able to:

CO1. Able to draw impedance diagrams for a power system network and to understand per unit quantities.
CO2. Able to form a Y bus and Z bus for a power system networks.
CO3. Able to understand the load flow solution of a power system using different methods.
CO4. Able to find the fault currents for all types faults to provide data for the design of protective devices.
CO5. Able to find the sequence components of currents for unbalanced power system network.

Unit	Contents	Hrs.
1	**Modeling of Power System:** Complex power flow, balanced and reactance diagrams of a power system, per unit system per unit representation of transformers, synchronous machines, representation of loads. Graph theory and its applications for formation of primitive network and Z and Y matrices, incidence matrices, Y-bus and Z-bus matrices	6
2	**Load Flow Studies:** Introduction, network model formulation, formation of Y-bus by singular transformation, load flow problem, Iterative methods of load flow such as Gauss Gauss-Seidel, Newton-Raphson method, decoupled load flow and fast decoupled load flow, Automatic Generation control.	6
3	**Symmetrical Fault Analysis:** Transients on a transmission line, short circuit of a synchronous machine on no load and on load. Short circuit current computation on no load and on load, selection of circuit breakers, Z-bus formulation, algorithm of short circuit studies	6
4	**Symmetrical Components:** Fundamentals of symmetrical components, sequence impedance and sequence network of star connected loads, transmission lines, synchronous machines and transformer sequence network of a loaded generator.	6

5	**Unsymmetrical Faults Analysis:** single line to ground (l-g), Line to line (L-L), double line to ground (L-L-G) faults analysis of above faults using bus impedance matrix, bus voltage and line current during faults. open conductor faults	**6**
6	**Security Analysis:** Basic Concepts, Security analysis, Load Dispatch centre, Contingency Analysis, preventive and emergency control, Electrical Power Quality, causes, affects, and mitigation methods.	**6**
	References: 1. "Power System Analysis", T.K. Nagsarkar, M.S. Sukhiya. (OXFERD U. P.) 2. I.J. Nagrath & D.P. Kothari, "Modern System Analysis", Tata McGraw-Hill 3. Stevenson W.D. and Grainger J.J. "Power System Analysis" McGraw-Hill 4. A.R. Bergen and Vijay Vittal, Power Systems Analysis, Pearson Education Asia, 2001. 5. Stagg W.D. & EI-AbiadA. H. "Computer Method in Power System Analysis", McGraw- Hill 6. H.Saadat "Power System analysis", McGraw- Hill 7. Elgred O.I. electrical Energy System Theory," McGraw-Hill.	

24UD1293PC402	**Network Theory**
Teaching Scheme Lectures Theory: 03 Hr / Week Credit:03	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. Understand and apply fundamental network topology concepts using graph theory and matrix representations.
2. Analyze electrical circuits with network theorems and transient responses to various inputs in time and frequency domains.
3. Examine three-phase systems, resonance behavior, and power calculations in balanced and unbalanced circuits.
4. Design and analyze basic filters, exploring low-pass, high-pass, band-pass, and band-stop filters with elementary synthesis techniques.

Course Outcome:

After completion of this course, students will be able to:

CO1. Understand the concepts of basic circuit laws, mesh and Nodal analysis of circuits and circuit theorems.

CO2. Apply the knowledge of basic circuit law to simplify the networks using network theorems.

CO3. Solve circuit problems using Laplace transform.

CO4. Calculate frequency response of filter, and various parameters of two port networks.

CO5. Analyze the transient, steady state and resonating behavior of circuits.

Unit	Contents	Hrs.
1	**Network Topology:** Graph Theory, Incidence Matrix, and Fundamental Loop Matrix, and Fundamental Cut set Matrix, Mesh and Nodal Analysis, Star-Delta Transformation, source transformation, Duality.	**6**
2.	**Network Theorems:** Superposition, Thevenin's, Norton's, Maximum power transfer. Tellengen's Theorem (AC and DC). Time and Frequency domain analysis of circuits for step, ramp, exponential and damped exponential inputs.	**6**
3	**Transient Analysis:** Review of ordinary linear non-homogeneous first and second orderdifferential equations with constant coefficients. Transient analysis of de circuits by classical method for unit step input only. Behaviour of circuit elements under switching action. Evaluation of initial conditions, software based simulation studies.	**6**
4	**Three Phase System and Resonance:** Introduction to Balanced and Unbalanced Three phase systems, Analysis of three phase systems, calculation of real and reactive powers. Resonant Circuits: Analysis of simple series RLC and parallel RLC circuits under resonances. Resonant frequency, Bandwidth, and Quality factor at resonance.	**6**

5	**Two port network:** Terminals& terminal pairs, Driving points & transfer admittance, Transfer functions, Concept of poles & zeroes, Two port networks, Z, Y & the transmission parameters relationship between parameter sets.	**6**
6	**Elements of Filter Design:** Low-Pass, high pass, band-pass and band stop filters; Butter worth and Chebyshev approximations; Design of 1st order and 2nd order low-pass filters; Elementary synthesis techniques.	**6**
	Reference: 1. Alexander and Sadiku, Electric Circuits, McGraw Hill Education, M. E. Van Valkenburg, Network Analysis, Prentice Hall,. 2. K.V.V. Publishing Murthy and M.S.Kamath, Basic Circuit Analysis, Jaico, 3. Mac.E Van Valkenburg, "Network Analysis", 4. Franklin Fa-Kun. Kuo, "Network Analysis & Synthesis", John Wiley & Sons. 5. Mac.E Van Valkenburg, "Network Synthesis,"	

24UD1293PC403	**Electrical Machine I**	
Teaching Scheme Lectures Theory: 03 Hr / Week Credit:03		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. Understand the construction, operating principles, and efficiency of single and three-phase transformers under different load conditions.
2. Analyze the characteristics, testing methods, and performance standards for transformers and DC machines.
3. Explore the design, operation, and troubleshooting of various types of DC machines, including special-purpose motors.
4. Apply Indian Standard specifications for testing, operation, and maintenance of transformers and DC machines.

Course Outcome:

After completion of this course, students will be able to:

CO1. Identify transformer, dc machine and three phase and single phase induction motors.
CO2. Evaluate and analyze the steady state parameters, operating characteristics and performance of transformers and dc machine
CO3. Analyze starting, speed control methods of dc and induction machines
CO4. Analyze and apply the energy conversion principles to rotating machines.
CO5. Select a suitable SRM, stepper motor, PMDC motor

Unit	Contents	Hrs.
1	**Single Phase Transformers:** Single-phase Transformer-EMF equation, equivalent circuit refer to either sides, transformer on different loads, pharos diagram, voltage regulation, losses, efficiency, maximum efficiency, energy efficiency, performance characteristics, auto transformers, variable frequency transformer, voltage & current transformers, welding transformers, pulse transformer **Numerical**	**7**
2	**Three Phase Transformers:** Construction, working principle, connections, factors affecting the choice of connection, voltage pharos diagram, vector groups, open delta or V-V connection, performance characteristics.	**7**
3	**Applications, Standards and Troubleshooting of Transformers:** Applications of various transformers, Scott connections, auto transformers, troubleshooting of various transformers and, study of relevant Indian Standard Specifications, transformer cooling, parallel operation of transformer, testing of transformer, three winding transformers, on load tap changing of transformers	**7**
4	**D.C. Machine:** Construction details, working principle, back EMF, generated EMF, methods of excitation, types of DC Machines, armature reaction, effect of armature reaction, commutation, magnetizing and demagnetizing ampere turns, torque equation, speed equation, **Numerical**	**6**

5	**Characteristics and Testing of DC Machine:** Open circuit characteristics of DC generator, DC motor: break test, Swinburne test, Hopkinson's test, losses and efficiency, condition for maximum efficiency, types of starters, speed control and braking methods of DC Motors, **Numerical**	**6**
6	**Trouble Shooting of DC Machines and Special purpose machines:** Various equipment's used to diagnose fault, troubleshooting of various DC motors and study of relevant Indian Standard. Permanent Magnet DC Motor (PMDC), Brushless DC Motor (BLDC), Steeper Motor, Servo Motor, SRM, Universal motor.	**6**
	References: 1. Nasser Syed, "Electrical Machines and Transformers", A New York, Macmillon 1984. 2. Leinsdorf A. S., "Principles of DC Machines", 6th Edition, McGraw Hill Book Company 1959. 3. P. C. Sen., "Principles of Electric Machines and Power Electronics", 2nd edition, John Wiley and Sons Inc., 1997. 4. M. G. Say, "Alternating Current Machines", 5th edition, Low price edition, ELBS, Reprinted 1994 5. Bhag S. Guru and Huseyin R. Hiziroglu, "Electric Machinery and Transformers", 3rd Indian edition, Oxford University Press, Reprint 2014. ***Text Books:*** 1. D. P. Kothari and I. J. Nagrath, "Electric Machines", Tata Mc Graw Hill Publication, 4th edition 2010, Reprint 2012. 2. P. S. Bimbhra: Electrical Machinery – Khanna Publishers, 7th edition, 2011.	

24UD1293VS404	**Electrical Installation and Estimation**
Teaching Scheme Lectures Theory: 02 Hr / Week Credit:02	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. Determine conductor sizes for internal wiring, overhead lines, and underground cables considering voltage drop and load requirements.
2. Prepare accurate estimates for material quantities and labor costs in electrical wiring and understand specifications for common accessories.
3. Understand contracting principles, including tendering, purchasing, and supplier selection processes within electrical installations.
4. Analyze components of electrical distribution systems and evaluate wiring systems' design, safety, and installation requirements.

Course Outcome:

After completion of this course, students will be able to:

CO1. Emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost Aviability.

CO2. Exposure to design and estimation of wiring, design of overhead and underground distribution lines, substations and illuminations design.

CO3. These techniques should help the students to successfully estimate costing of the products/projects that are part of our everyday usage.

CO4. a basic knowledge on methods and types of estimation and its merits and demerits

CO5. To prepare the schedule of materials with specifications and estimates for different types of electrical installations.

Unit	Contents	Hrs.
1	Estimating and Determination of conductor size for internal wiring, HT and LT Overhead Lines and Underground Cables: Various steps to form an estimate, Price catalogue, Schedule of labour rates, Schedule of rates and estimating data, Conductor size, calculations for internal domestic wiring, Permissible voltage drops for lighting and industrial load, simple numerical, Conductor size calculation for underground cables: General considerations, Simple numerical, Conductor size calculations for overhead lines with A.C.S.R. conductors, simple numerical	6
2	Preparation of estimate of quantity of material required for wiring of a house (typical plan of house including electric layout is to be given). Drawing of electrical circuit for such electrification. Specification for accessories like AC energy meter, main switch, Tumbler switch, Electric heater, Fluorescent tube, Chokes for tubes, starters, bulbs, and Insulation tapes.	6

3	Principles of Contracting: Purchasing techniques, Spot quotations, Floating limited enquiry, Typical example of quotation form, preparation of comparative statement, Analysis of comparative statement, Tenders types (Single tender, Open tender), Earnest money, Security deposit, Various steps involved in complete purchase, Typical order formats, various criteria for selecting the supplier, General considerations in order form, Procedures to be followed for submitting the tenders & quotations. Purchase Department, Objective, activities, duties and functions, purchase organization, Centralized and decentralized purchasing, relative advantages and disadvantages, Applications	**6**
4	Study of different types of components in electrical distribution system: Cables: Classification, general construction, types of cables, jointing of cables, measurement of insulation resistance, Insulators: Requirements, materials used, types (Pin, Suspension, Strain, Stay) Substation: Different types, classification, design consideration, various symbols, complete arrangement of substation (Single and double bus bar), key diagrams for typical substations.	**6**
5	Wiring systems: general, Fire performance of wiring systems, External influences Mechanical damage: general, concealed and buried cables, Damage by fauna, flora and mould growth, Building design considerations, Solar radiation, Proximity to other services: general, Proximity of electrical wiring	**6**
	systems to other electrical systems, Proximity of electrical wiring systems to communications cables, Proximity of electrical wiring systems to nonelectrical systems, Methods of installation of cables General, Current-carrying capacities, cross-sectional area of conductors and conductor operating temperatures, Voltage drop, Grouping.	
6	Resistances of copper conductors, Electrical connections, Cable supports and cable management systems, Maximum cable support spacing, Overhead cable, between buildings, Supports for conduits, Minimum bending radii of cables, Maximum cable trunking support spacing ,Other cable management systems Minimizing the risk of fire Electromagnetic and electromechanical effects ,Conduit and trunking cable capacities , Conduit capacities ,Trunking capacities ,Maintainability	**6**
	References: 1. Electrical Design Estimating and Costing, K.B. Raina, S.K. Bhattacharya, New Age International Publisher. 2. Design of Electrical Installations, Dr. V.K. Jain, Dr. Amitabh Bajaj, University Science Press. **3.** Electricity pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P.E., CRC Press. 4. Guide for Electrical Layout in residential buildings, Indian Standard Institution, IS:4648-1968 5. Electrical Installation buildings Indian Standard Institution, IS:2032.	

24UD1293PC407L	**Network Theory Lab**	
Teaching Scheme Practical: 02 Hr / Week Credit:01		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Unit	Contents	Hrs.
1	Verification of Kirchhoff's Current & Voltage Law	**2**
2	Verification of Thevenin's Theorem	**2**
3	Verification of Superposition Theorem	**2**
4	Verification of Nortan's Theorem	**2**
5	Verification of Maximum power Transfer Theorem	**2**
6	Determination of Transient Response of current in RL, RC, and RLC circuit with step input.	**2**
7	Determination of frequency Response of current RLC circuit sinusoidal input	**2**
8	Determination of characteristics of passive filters	**2**
9	Determination of Driving point and Transfer Function of two port ladder network and verify with theoretical values	**2**

24UD1293PC408L	**Electrical Machine I Lab**	
Teaching Scheme Practical: 02 Hr / Week Credit:01		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Unit	**Contents**	**Hrs.**
1	To perform open circuit (OC) and short circuit (SC) test on single phase transformer to estimate its core loss, copper loss and equivalent circuit parameters.	**2**
2	To perform direct load test on single phase and three phase transformer to btain its % efficiency and % voltage regulation at various loading conditions.	**2**
3	Parallel operation of two single-phase transformers to study their load sharing under various operating conditions.	**2**
4	To perform open delta (V-V) connection of identical two single-phase transformers to obtain three phase transformation.	**2**
5	Verification of Scott-connection of two single-phase transformers to obtain 2 phase to 3 phase transformation.	**2**
6	Verification and analysis of no load current waveform of single phase transformer.	**2**
	Separation of transformer core loss into eddy current loss and hysteresis loss.	**2**
7	Determination of magnetization, external and internal characteristics of a DC shunt generator.	**2**
8	Determination of efficiency of a dc shunt or compound generator at various loading conditions.	**2**
9	Speed control of a separately dc Shunt motor by- (i) armature voltage control and (ii) Field current control method.	**2**
10	Direct load test on separately excited dc shunt motor to obtain it's on load Efficiency.	**2**
11	Estimation of efficiency of a dc shunt or compound machine by performing Swinburne's test.	**2**

24UD1293PC409L	**Power System Analysis Lab**	
Teaching Scheme Practical: 02 Hr / Week Credit:01		**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Unit	**Contents**	**Hrs.**
1	Write a program to draw the per unit reactance diagram of a given power system.	**2**
2	Solution of building the Bus Admittance matrix for given power system network.	**2**
3	Solution of power flow problem of a given power system using Gauss-Siedel method.	**2**
4	Solution of power flow problem of a given power system using Newton Raphson Method.	**2**
5	Solution of power flow problem of a given power system using Fast Decoupled method.	**2**
6	Single Line to Ground Fault (L-G) analysis of a Three Phase Transmission Line at no load and light load conditions.	**2**
	Line to Line Fault (L-L) analysis of Three Phase Transmission Line at No load and Light load conditions.	**2**
7	Double Line to Ground Fault (LLG) analysis of Three Phase Transmission Line at No load and Light load conditions.	**2**
8	9. Symmetrical L-L-L Fault analysis of Three Phase Transmission Line at No load and Light load conditions.	**2**

उपयोवजत मराठी/ व्यावहारिक मराठी	
Teaching Scheme Lectures Theory: 02Hr / Week Credit:02	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. मराठी भाषेचा ऐततहातसक प्रवास, ततच्या तनतमितीतील संस्कृत, प्राकृत आतण अपभ्रशं भाषांचा प्रभाव समजनू घेणे.
2. मराठी लेखनाचेतनयम, व्याकरण व शद्धु लेखन यांची अचकू ता आत्मसात करणे.
3. सजिनशील आतण औपचाररक लेखन कौशल्येतवकतसत करणे.
4. भाषांतर तत्त्वे, प्रतिया आतण सांस्कृततक संदभियांचा तवचार करून मराठीतनू इग्रं जी आतण इग्रं जीतनू मराठी भाषांतर करण्याचेकौशल्य प्राप्त करणे.

Course Outcome:

After completion of this course, students will be able to:

CO1. तवद्यार्थी मराठी भाषेच्या ऐततहातसक प्रवासाची समज वाढवतील आतण ततच्या तवकासातील टप्पेस्पष्टपणे सांगूशकतील.
CO2. शद्धु व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होईल.
CO3. तवतवध प्रकारच्या लेखन शैली आत्मसात करून सजृ नशील, तवश्लेषणात्मक आतण औपचाररक लेखन करू शकतील.
CO4. अचकू, स्पष्ट आतण भातषक-सांस्कृततक दृतष्टकोनातनू योग्य भाषांतर करू शकतील.
CO5. व्यावसातयक आतण सातहतत्यक भाषांतरात प्रावीण्य तमळवूशकतील.

Unit	Contents	Hrs.
1	**मराठीचा उगम आणि विकास** • मराठीचा उगम आणि विकास • मराठी भाषेवर संत परंपरेचा प्रभाव- ज्ञानेश्वर, तुकाराम, नामदेव आणि एकनाथ यांच्या रचनांचा अभ्यास • मराठीत बखरी लेखन व इतिहासदर्शन. • आधुनिक मराठी आणि सुधारणा चळवळी- टिळक, फुले, आणि आगरकर यांचे योगदान	5
2	**स्वातंत्र्यानंतरची मराठी भाषा** • महाराष्ट्र राज्य निर्मिती व मराठीचा अधिकृत दर्जा • डिजिटल युगातील मराठी भाषा ब्लॉग, सोशल मीडिया आणि ई-साहित्य. • मराठी भाषा संरक्षणासाठी उपाययोजना • शिक्षणव्यवस्थेतील मराठीचा वापर • जागतिक स्तरावर मराठी भाषेचा प्रभाव,	4
3	**मराठी लेखनाचे नियम आणि व्याकरण** • संधि • वाक्यप्रकार (विधानार्थी वाक्य, प्रश्नार्थी वाक्य, आज्ञार्थी वाक्य इ.) • विरामचिन्हे आणि त्याचे उपयोग • शुद्धलेखन • समानार्थी शब्द (पर्यायवाची शब्द), विरुद्धार्थी शब्द	4

4	**लेखन कौशल्य** लेखन कौशल्याचा पररचय- लेखन कौशल्याचेमहत्त्व आतण आवश्यकता • पत्रलेखन • तनबंध लेखन • वत्तृ लेखन (वत्तृ पत्रीय लेखन) • इततवत्तृ लेखन • सारांश लेखन	**4**
5	**भाषांतर (मराठीतून इंग्रजी अणि इंग्रजीतून मराठी)** • भाषांतराचा मूलभूत परिचय- भाषांतराची व्याख्या आणि स्वरूप, महत्त्व आणि उपयोग, भाषांतराचे प्रकार इ. • पारिभाषिक शब्दावली • मराठीतून इग्रजी आणि इंग्रजीतून मराठी भाषांतर,	**4**
	TEXT/REFERENCE BOOKS: 1. प्रशासनिक लेखन, भाषा संचालनालय, महाराष्ट्र शासन, मुंबई १९६६ 2. सुगम मराठी व्याकरण व लेखन - मो.रा. वाळबे 3. "अनुवाद सिद्धांत आणि प्रयोग" डॉ. भालचंद्र नेमाडे (लोकवाक्य गृह प्रकाशन) 4. मराठी भाषा आणि साहित्याचा इतिहास वि. का. राजवाडे प्रकाशक राजवाडे संशोधन मंडल, धुळे 5. भाषांतर सिद्धांत आणि प्रयोग डॉ अशोक केळकर प्रकाशक लोकवाङ्गय गृह, मुंबई	

सामान्य हिदा / व्यावहारिक हिदा	
Teaching Scheme Lectures Theory: 02Hr / Week Credit:02	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. हिंदी भाषा के उद्भव, विकास और ऐतिहासिक प्रवृत्तियों को समझाना।
2. हिंदी व्याकरण और लेखन कौशल में दक्षता प्रदान करना।
3. प्रशासन, शिक्षा और संचार में हिंदी के व्यावहारिक उपयोग को स्पष्ट करना।
4. अनुवाद कौशल विकसित करना, जिससे तकनीकी एवं व्यावसायिक संचार सुगम हो।

Course Outcome:

After completion of this course, students will be able to:

CO1. विद्यार्थी हिंदी भाषा के ऐतिहासिक और आधुनिक विकास को समझेंगे।

CO2. हिंदी व्याकरण और लेखन के नियमों में दक्षता प्राप्त करेंगे।

CO3. व्यावसायिक, प्रशासनिक और तकनीकी लेखन में हिंदी का प्रयोग कर सकेंगे।

CO4. अनुवाद के सिद्धांतों को सीखकर अंग्रेजी और हिंदी के बीच प्रभावी अनुवाद कर सकेंगे।

Unit	Contents	Hrs.
1	**हिंदी भाषा का उद्भव और स्रोत** • हिंदी भाषा की उत्पत्ति और स्वरूप • संस्कृत, प्राकृत और अपभ्रंश से हिंदी का विकास • हिंदी की प्रमुख बोलियाँ (ब्रज, अवधी, खड़ी बोली, भोजपुरी, राजस्थानी आदि) • हिंदी पर फारसी, अरबी और अंग्रेज़ी भाषाओं का प्रभाव	5
2	**स्वातंत्र्योत्तर काल में हिंदी भाषा** • प्रशासन, शिक्षा और संचार माध्यमों में हिंदी की भूमिका • राजभाषा के रूप में हिंदी संवैधानिक स्थिति और व्यावहारिक उपयोग • हिंदी का वैश्विक विस्तार और डिजिटल माध्यमों में हिंदी की उपस्थिति • प्रशासन और संचार माध्यमों में हिंदी	4
3	**हिंदी भाषा लेखन के नियम और व्याकरण** • वर्णमाला • शब्द-भेद • संधि • वाक्य रचना • वर्तनी • उपसर्ग, प्रत्यय और शब्द निर्माण की प्रक्रिया • विराम चिन्हों का प्रयोग • पर्यायवाची शब्द • विलोम शब्द	4

4	**लेखन कौशल** • पत्र लेखन • प्रतिवेदन (रिपोर्ट) लेखन • विज्ञमि, नोटिस और परिपत्र लेखन • निबंध लेखन • सार लेखन	**4**
5	**अनुवाद (अंग्रेजी से हिंदी और हिंदी से अंग्रेजी)** • अनुवाद: सिद्धांत और परंपरा • अनुवाद: क्षेत्र, प्रकार • पारिभाषिक शब्दावली • अंग्रेजी से हिंदी और हिंदी से अंग्रेजी अनुवाद	**4**
	TEXT/REFERENCE BOOKS: "हिंदी भाषा का उद्भव और विकास डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन) "हिंदी भाषा का इतिहास डॉ. रामविलास शर्मा (राजकमल प्रकाशन) "भारत में राजभाषा हिंदी" डॉ विसनराव प्रसाद (भारतीय राजभाषा परिषद) "हिंदी व्याकरण और रचना" डॉ. हरीशचंद्र वर्मा (लोकभारती प्रकाशन) हिंदी लेखन कौशल डॉ. रमेश गुप्ता (साहित्य भवन) "अनुबाद विज्ञान और सिद्धांत डॉ. ओमप्रकाश (राजकमल प्रकाशन)	

संस्कृत

Teaching Scheme	Examination Scheme
Lectures Theory: 02Hr / Week Credit:02	Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

1. संस्कृत भाषेचा ऐतिहासिक प्रवास
2. संस्कृत लेखनाचे नियम, व्याकरण आत्मसात करणे.
3. दैनंदिन संवादासाठी लागणारे काही शब्द यांचा अभ्यास करणे.

Course Outcome:

After completion of this course, students will be able to:

CO1. विद्यार्थी संस्कृत भाषेच्या ऐतिहासिक प्रवासाची समज वाढवतील आणि तिच्या विकासातील टप्पे स्पष्टपणे सांगू शकतील.

CO2. शुद्ध व प्रमाणबद्ध लेखन करण्याची क्षमता प्राप्त होईल.

CO3. विविध प्रकारच्या लेखन शैली आत्मसात करून लेखन करू शकतील.

CO4. अचूक, स्पष्ट आणि भाषिक-सांस्कृतिक दृष्टिकोनातून योग्य भाषांतर करू शकतील.

Unit	Contents	Hrs.
1	**Introduction to Sanskrit** • Importance and history of Sanskrit • Sanskrit alphabets (Varnamala) • Swaras (Vowels) • Vyanjanas (Consonants) • Pronunciation and script (Devanagari)	5
2	**Basic Grammar** • Nouns, pronouns, Grammatical numbers, Grammatical genders, Grammatical person • Verbs, Tenses, Sandhi (Combination of letters) • Karaka (Case system) – Nominative, Accusative, Instrumental, etc. • Vibhakti (Declensions of nouns and pronouns) • Linga (Gender: Masculine, Feminine, Neuter) • Vakya Rachana (Sentence construction)	4
3	**Simple Vocabulary and Sentence Formation** • Basic words and their meanings (nature, family, animals, objects, etc.) • Greetings and basic conversational phrases • Formation of simple sentences	4
4	**Selected Sanskrit Shlokas and Subhashitas** • Recitation and meaning of simple verses from Bhagavad Gita, Hitopadesha, or Panchatantra • Common proverbs (Subhashitas)	4
5	**Reading and Writing Practice** • Reading simple Sanskrit texts • Writing small paragraphs in Sanskrit	4

24UD1000HM411A	**Patents and IPR**
Teaching Scheme Lectures Theory: 02Hr / Week Credit:02	**Examination Scheme** Internal Assessment: 20 Marks Mid-Sem Exam: 20 Marks End Sem Exam: 60 Marks

Course Objective:

5. Understand the fundamentals of patents, designs, and copyrights and the patent classification system in India.
6. Analyze the scope of patent rights, including licensing, technology transfer, and the use of patent databases.
7. Explore the evolution, significance, and administration of intellectual property rights (IPR) in India and internationally.
8. Examine recent developments in IPR across biological systems, software, and traditional knowledge through case studies.

Course Outcome:

After completion of this course, students will be able to:

CO6. Demonstrate proficiency in patent categorization and practical patent procedures.
CO7. Utilize patent databases effectively.
CO8. Grasp the significance of IPR and its historical context.
CO9. Stay updated on the latest IPR developments, especially in biological systems and computer software
CO10. Apply acquired knowledge and problem-solving skills to real-world cases related to patents and IPR

Unit	Contents	Hrs.
1	**Patents** Designs, Trade and Copyright, Classification of patents in India, Categories of Patent, Special Patents, Patent document, Granting of patent, Rights of a patent, Patent Searching, Patent Drafting, filing of a patent, different layers of the international patent system, Utility models	5
2	**Patent Rights** Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	4
3	**Overview of Intellectual Property** Introduction of IPR, Need for intellectual property right (IPR), IPR in India – Genesis and Development IPR in abroad.	4
4	**New Developments in IPR** Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge, Case Studies	4
5	**Case studies:** Case studies related to patents and IPR	4
	TEXT/REFERENCE BOOKS: 1. Feroz Ali, The Law of Patents, LexisNexis 2. Ronald D. Slusky, Invention Analysis and Claiming – A Patent Lawyer's Guide, Second Edition, American Bar Association, 2012. 3. Feroz Ali, The Touchstone Effect – The Impact of Pre-grant Opposition on Patents, LexisNexis, 2009.	

Constitution of India

Teaching Scheme	Examination Scheme
Lectures Theory: 02 Hr / Week	Internal Assessment: 20 Marks
Credit: Audit	Mid-Sem Exam: 20 Marks
	End Sem Exam: 60 Marks

Course Objective:

1. Understand the foundational aspects of the Indian Constitution, including its historical context, key features, and amendment procedures.
2. Analyze the structure, powers, and functions of the Union and State Executives, Legislatures, and Judiciary in India.
3. Examine the Indian legal system, including sources of law, court hierarchy, arbitration, and essential laws related to contracts and torts.
4. Explore intellectual property laws, the Right to Information Act, e-governance, and the role of engineers in governance and industrial development.

Course Outcome:

After completion of this course, students will be able to:

CO1. Identify and explore the basic features and modalities about Indian constitution.
CO2. Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
CO3. Differentiate different aspects of Indian Legal System and its related bodies.
CO4. Discover and apply different laws and regulations related to engineering practices.
CO5. Correlate role of engineers with different organizations and governance models.

Unit	Contents	Hrs.
1	**Introduction and Basic Information about Indian Constitution:** Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.	6
2	**Union Executive and State Executive:** Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.	6
3	**Introduction and Basic Information about Legal System:** The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles	6

	taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace	
4	**Intellectual Property Laws and Regulation to Information:** Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.	**6**
5	**Business Organizations and E-Governance:** Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.	**6**
	References: 1. Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition. 2. Granville Austin: The Indian Constitution: Cornerstone of a Nation. 1966, Oxford Clarendon Press. 3. Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018. 4. PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing. 5. V.K. Ahuja: Law Relating to Intellectual Property Rights (2007) 6. Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88 7. P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi 8. Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman. 9. BL Wadehra: Patents, Trademarks, Designs and Geological Indications.Universal Law Publishing - LexisNexis. 10. Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections) 11. Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36). https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf 12. Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India, https://www.meity.gov.in/writereaddata/files/eGovernance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf 13. Companies Act, 2013 Key highlights and analysis by PWC.	

Department of Electrical Engineering

Credit Framework under Four-Years UG Engineering Programme with Multiple Entry and Multiple Exit options:

- The Four-year Bachelor's Multidisciplinary Engineering Degree Programme allows the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning from different institutions.

- The minimum and maximum credit structure for different levels under the Four-year Bachelor's Multidisciplinary Engineering UG Programme with multiple entry and multiple exit options are as given below:

Credit Framework

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	One Year UG Certificate in Engg./ Tech.	40	44	2	1
5.0	Two Years UG Diploma in Engg./ Tech.	80	88	4	2
5.5	Three Years Bachelor's Degree in Vocation (B. Voc.) or B. Sc. (Engg./ Tech.)	120	132	6	3
	4-Years Bachelor's degree				

- There are multiple exit options at each level. Student will be given a specific Qualification mentioned in the table depending on the level at which he/she decide to have an exit. Ex. If a student decides to exit after completion of two years (level 5.0) of the program, he will be given a Diploma in Engineering with specific exit condition mentioned in the syllabus of the specific branch. He/she can rejoin the program with the multiple entry option at the level next where he/she chose to exit previously. (Student can join at level 5.5 if successfully completed level 5.0 previously at the time of exit).
- Minimum credit requirements of each level are mentioned in the credit framework table.
- There are 4 distinct options available at level 6.0.
- First one is basic level 6.0 option where minimum 160-maximum 176 credits are mandatory which can be completed as per the Semester-wise Credit distribution structure mentioned in the table given below.

  Here, the Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with multidisciplinary minor (min.160-max.176 Credits) i.e. "**B. Tech in Electronics and Telecommunication Engineering with Computer Engineering**" (160-176 credits) enables students to take up five-six or required additional courses of 14 credits in the

discipline other than Electronics and Telecommunication Engineering distributed over semesters III to VIII. Here in the case of "**B. Tech in Electronics and Telecommunication Engineering with Computer Engineering**" (160-176 credits) student is supposed to take up 50% or more courses to complete the 50% or more credits (from assigned 14 credits) from **Computer Engineering minor bucket**. The remaining courses to complete the assigned 14 credits can be covered from other discipline's minor buckets.

- Remaining three level 6.0 options are the advanced options where the student is given an opportunity to get extra qualification by earning some extra credits (18-20 extra credits). These three options are given below:

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
6.0	(B.E./ B.Tech. or Equivalent) in Engg./ Tech. with Multidisciplinary Minor	160	176	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honors and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honors with Research and Multidisciplinary Minor	180	194	8	4
6.0	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors)	180	194	8	4

- Level 6.0: The **Bachelor's Engineering Degree with Honours** in chosen Major Engg./ Tech. Discipline i.e. in Electronics and Telecommunication Engineering with Honours with Multidisciplinary Minor (180-194 credits) enables students of Electronics and Telecommunication Engineering to take up five-six additional courses of 18 to 20 credits in the Electronics and Telecommunication Engineering discipline distributed over semesters III to VIII. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, which are over and above the min.160-max.176 Credits prescribed for the duration of four years will be taken by Academic Authorities of University. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.
- Level 6.0: The **Bachelor's Engineering Degree with Research** in i.e. in Electronics and Telecommunication Engineering with Research with Multidisciplinary Minor (180-194 credits) enables students of Electronics and Telecommunication Engineering to take up a research project of 18 to 20 credits in the Electronics and Telecommunication Engineering discipline distributed over semesters VII to VIII. **Student must have CGPA equal to or greater than 7.5 at the end of sixth semester to go for this option**.
- Level 6.0: The **Bachelor's Engineering Degree in chosen Engg./ Tech. Discipline with Double Minor** (Multidisciplinary and Specialization Minor, 180-194 credits), i.e. "**B. Tech in Electronics and Telecommunication Engineering with *other selected discipline in* Engineering (as MDM) with Specialization Minor in Computer Engineering**" (180-194 credits) enables students to take up five-six additional courses of 14 credits in the discipline other than Electronics and Telecommunication Engineering(for completion of multidisciplinary minor) and 18 to 20 extra credits in the **Computer Engineering discipline** distributed over semesters III to VIII. Here, the ***other selected discipline* in Engineering should be different from Specialization Minor i.e. Computer Engineering**. This enables students to take up five-six or required additional courses of 18 to 20 credits in the **Computer Engineering** discipline distributed over semesters III to VIII, which are over and above the min.160-max.176 Credits. The decision regarding the mechanism of distribution of these 18-20 credits over semesters III to VIII, prescribed for the duration of four years will be taken by Academic Authorities of University. **Student must have CGPA equal to or greater than 7.5 at the end of second semester to go for this option**.
- Students need to follow the Semester-wise Credit distribution structure for Four Year UG Engineering Program as prescribed in the table given above.
- There are seven vertical categories with specific credits distributed in specific semesters.
- Student can choose a Program Elective Course (PEC) in that specific semester from the given subjects.
- Multidisciplinary courses (MDM) and Open Elective (OE) courses can be chosen from the MDM and OE Buckets depending on students choice. Completion of total credits given in the last column of the table for each vertical is mandatory.
- Students can complete 40% of the courses through online platforms like NPTEL/SWAYAM. The NPTEL SWAYAM course content should be at least 80% similar to the course content in the syllabus

Semester-wise Credit distribution structure for Four Year UG Engineering Program - One Major, One Minor

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		--	--	--	--	--	14-18
Engineering Science Course		10-08	06-04		--	--	--	--	--	16-12
Programme Core Course (PCC)	Program Courses	--	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		--	--	--	--	04	08	02	06	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		-	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship/Economics/ Management Courses		--		02	02	--	--	--	--	04
Indian Knowledge System (IKS)			02		--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--		04	04
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	-	-	02
Project		--	--	--	--	--	--		04	04
Internship/ OJT		--	---			--	--	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	-	04
Total Credits (Major)		**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**20-22**	**160-176**

General Rules and Regulations

1. The normal duration of the course leading to B.Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M.Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be

scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

Registration:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full- Time Student of a UG/PG Programme:

   A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.
3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:
   i) Satisfied all the Academic Requirements to continue with the programme of Studies without termination
   ii) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;
   iii) Paid all required advance payments of the Institute and hostel for the current semester;
   iv) Not been debarred from registering on any specific ground by the Institute.

Evaluation System:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2023-24, from I year B. Tech.

Percentage of marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eighth semester of B.Tech Program.

CGPA for pass is minimum 5.0	
CGPA upto <5.50	Pass class
CGPA ≥ 5.50&<6.00	Second Class
CGPA ≥ 6.00&<7.5	First Class
CGPA >7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

Mid Semester Exam (MSE) Marks	20
Continuous Assessment Marks	20
End Semester Examination(ESE)Marks	60

4. A total of 100 Marks for each practical course are distributed as follows

1.	Continuous Assessment Marks	40
2.	End Semester Examination (ESE)Marks	60

- It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, M. Tech to score a minimum of 45 marks out of 100 with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.
- This will be implemented from the first year of B. Tech starting from Academic Year 2023-24

5. Description of Grades

EX Grade: An 'EX' grade stands for outstanding achievement.

EE Grade: The 'EE' grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.

If any of the students remain absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance

a. Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

'n' is the number of subjects for the semester,

'c_i' is the number of credits allotted to a particular subject, and

'g_i' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

b. Cumulative Grade Point Average (CGPA):

An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where,

'm' is the total number of subjects from the first semester onwards up to and including the semester S,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

CGPA will be rounded off to the second place of decimal and recorded as such.

7. Attendance Requirements:

a. All students must attend every lecture, tutorial and practical classes.

b. To account for approved leave of absence (eg. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted. If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination. The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be. In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.

c. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.

d. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

8. Transfer of Credits:

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a. 20 % of the total credit will be considered for respective calculations.
b. Credits transferred will be considered for overall credits requirements of the programme.
c. Credits transfer can be considered only for the course at same level i.e UG, PG etc.
d. A student must provide all details (original or attested authentic copies) such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.
e. A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.
f. Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.
g. In exceptional cases, the students may opt for higher credits than the prescribed.