Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3301: Signals & Systems				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	01 Hrs/week		ISE	20
Total Credits	04		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Linear algebra and Calculus ,Differential and Integral Calculus

Course Outcomes (CO): Students will be able to

CO1	**Compare** CT and DT signals and analyse LTI systems in frequency domain.
CO2	**Analyse** and design the time domain and frequency domain behaviour of higher order systems
CO3	**Analyse** and characterize of LTI systems using Laplace and Z Transforms
CO4	**Transform** given set of state variables into another form by using different transform methods

	Course Contents	CO	Hours
Unit 1	**Continuous and Discrete Time Signals and Systems:** Continuous and Discrete Time Signals, Signal Energy and Power CT and DT Exponential and Sinusoidal Signals CT and DT Unit Impulse and Unit step signals CT and DT systems-Basic System properties Linear Time Invariant (LTI) Systems, Discrete time LTI System- Convolution Sum Continuous time LTI systems-Convolution Integration Causal LTI systems described by differential and difference equations Singularity Functions	**CO1**	**(08)**
Unit 2	**Fourier series representation and Fourier Transforms:** Fourier series representation of CT periodic signals Properties of CT Fourier series Fourier series representation of DT periodic signals Properties of DT Fourier series Fourier Transform for periodic signals Properties of CTFT The Discrete Time Fourier transform (DTFT) Properties of CTFT	**CO2**	**(07)**
Unit 3	**Time and Frequency Characterization of Signals and Systems:** The magnitude and phase representation of the frequency response of LTI systems Ideal filters and time and frequency domain aspects of non-ideal filters. First and second order CT systems First and second order DT systems	**CO2**	**(05)**
Unit 4	**Laplace and Z Transforms:** Analysis and characterization of LTI systems using Laplace Transforms Analysis and characterization of LTI systems using Z Transforms	**CO3**	**(07)**
Unit 5	**State Space Analysis:** State space equations, Solution of State Equations for Continuous Systems, Linear transformation of State Vector, Controllability and Observability, State space Analysis of Discrete system	**CO4**	**(06)**
Unit 6	**Sampling** Sampling theorem, Aliasing and reconstruction of signal from its samples **Transformations** Symmetrical components of unsymmetrical phasor Park's Transformation and its applications Clark's Transformation **Harmonic Analysis of Electrical Signals** Definition of harmonics, Fourier's theorem, Harmonic sources, Effects of harmonics	**CO4**	**(07)**

Text Books

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.

Reference Books

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.
2. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
3. Ned Mohan, "Power Electronics-Converters ,Applications and Design"
4. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education
5. HadiSaadat, "Power System Analysis" Tata McGraw Hill Edition

Useful Links

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1.	https://nptel.ac.in/courses/108104100/
2.	https://nptel.ac.in/courses/108105055/
3.	https://nptel.ac.in/courses/117101055/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	3	2	2	2	-	-	-	-	-	3	3	1
CO 2	3	3	2	2	3	-	-	-	-	-	3	3	1
CO 3	3	3	2	2	3	-	-	-	-	-	3	3	1
CO 4	3	3	2	3	3	-	-	-	-	-	3	3	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember			
Understand			
Apply	10	5	20
Analyse	5	10	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3302- DC Machines and Transformer				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/Week		**MSE**	20
Tutorials	00 Hrs/Week		**ISE**	20
Total Credits	03		**ESE**	60
			Duration of ESE	02:30 Hrs

Course Outcomes (CO): After completion of course the Students will be able to

CO1	Apply engineering concepts in construction & working of DC machines
CO2	Formulate mathematical equations to model DC machines for obtaining various parameters under different loading conditions.
CO3	Apply engineering concepts in construction & working of Transformers.
CO4	Make selection of appropriate machine for different applications.

	Course Contents	CO	Hrs
Unit 1	Transformer- single phase: Transformer construction, Condition for Maximum Efficiency, Losses in Transformers, Transformer reactance's and equivalent circuits, Effect of load on power factor, Phasor diagrams, Testing of Transformer-Load test, Open Circuit and Short Circuit Tests, Sumpner's test, separation of losses polarity test, Parallel Operation, Scott connection.	CO1 CO2	**(07)**
Unit 2	Three phase transformer: Construction, working, types, connections, applications, testing, parallel operation, open delta, Special transformers: Autotransformer:- Autotransformer Working, Advantages of Autotransformer over Two winding Transformer, Audio frequency transformer, Grounding transformer, welding transforms, , Isolation Transformer and its applications, High Frequency Transformer.	CO1 CO2	(07)
Unit 3	D.C. Machines Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation. Concept of General terms pertaining to Rotating Machines: Electrical and Mechanical degree, Pole pitch, Coil, Generated EMF in full pitched coil, Generated EMF in a short pitched coil	CO1 CO3	(07)
Unit 4	D.C. Generators. Types, Characteristics of D.C. Generators, Separately Excited DC Generator, Voltage Build-up in Self-Excited Generator, D.C. Shunt, D.C. Series and D.C. Compound Generator Characteristics and applications. Parallel operation of d.c. shunt, series and compound generators.	CO1 CO5	(07)
Unit 5	Dc motors: Working principle of Motor, Back E.M.F., Types, characteristics and applications of DC Motors, Equivalent Circuit of a D.C. Motor, Torque of DC Motor, losses and efficiency,Need of starter, three point and 4 point starter	CO1 CO5	(07)
Unit 6	Speed control of dc shunt/series motors, testing, Braking in dc motors: Dynamic braking, plugging, regenerative and numericals based on it.	CO1 CO4	(07)

Text Books	
1.	Kothari D.P, Nagrath I.J., Electric Machines, TMH Publications, 4th Edition
2.	Alexander S Langsdorf, Theory of Alternating Current Machinery, 2nd edition, Tata McGraw-Hill, 2001
3.	Dr. Bimbhra P.S., "Electric Machinery", Khanna Publisher, Fifth Edition
Reference Books	
1.	M.G. Say and E. O. Taylor, Alternating current machines, Pitman publication
2.	Irving L Koskow, Electric Machinery and transformer, 2nd Edition, Prentice Hall Indi
Useful Links	
1.	nptel.ac.in/courses/108105017/
2.	www.nptelvideos.in/2012/11/electrical-machines-i.html by D Kashta, IIT Khargpur

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Mapping of COs and Pos

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	2	1	-	-	-	-	1	1	3	2
CO 2	3	2	2	1	2	-	-	-	-	1	1	3	1
CO 3	3	2	1	1	2	-	-	-	-	-	1	3	2
CO 4	3	2	1	1	3	1	-	-	-	1	1	3	2

Assessment Pattern: (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	8	20
Understand	5	4	10
Apply	5	4	10
Analyse	5	4	20
Evaluate	-	-	-
Create	-	-	-
Total	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3303:Measurements and instrumentation				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Mathematics, Network Theory

Course Outcomes (CO): Students will be able to

CO1	Apply physical laws used in different measuring instruments.
CO2	Analyse the dynamic response and the calibration of instruments.
CO3	Recognise need of using advanced and contemporary instruments.
CO4	Understand proper sensor technologies for specific applications

	Course Contents	CO	Hours
Unit 1	Fundamentals of Measurement: Performance characteristics (static, dynamic), Concepts relating to Measurements: True value, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead-band, Sensitivity, Errors in Measurements, Current and Voltage Measurements: Shunts, Potential Dividers, Instrument Transformers.	**CO1**	**(06)**
Unit 2	Measurements of R, L and C: Types of AC and DC bridges. Measurement of low, medium, and high resistance. Measurement of power and energy in single phase and poly-phase circuits. Calibration of energy meter.	**CO1**	**(06)**
Unit 3	Measurement using digital instruments: Digital meters: Ammeter, Voltmeter, and multimeter, wattmeter, and Energy meter. Basic circuitry of electronic counter, frequency measurement using electronic counter.	**CO2**	**(06)**
Unit 4	Sensors and Transducers for physical parameters: Sensors & transducers for common engineering measurements like temperature, pressure, torque, level, displacement, flow, Speed and Position Sensors. Opto-electronics-Shaft encoders, CD Sensors, Vision System etc.	**CO3**	**(06)**
Unit 5	Recent developments in Instrumentation and Measurements: Introduction to PLC, Wave Analysers and Harmonic Distortion, Power Analyzer, Fiber Optic Transducers, Micro sensors, Smart Sensors, Virtual Instrumentation. Hall effect transducers, Strain gauge.	**CO4**	**(06)**
Unit 6	Instrumentation & Sensor Technologies for Engineering Applications: Measurement and Instrumentation for Industrial Automation.	**CO4**	**(06)**

Text Books

1. Instrumentation: Measurement and Analysis, Nakra and Chaudhari, Tata McGraw Hill, New Delhi
2. Alan S. Morris, Reza Langari, "Measurement and Instrumentation: Theory and application", Academic Press, 2012.
3. Ernest O.Doebelin, "Measurement Systems Application and Design, International Student Edition", McGraw Hill Book Company, 1998.

Reference Books

1. Electrical Measurement and Measuring Instruments, Fifth edition, by E. W. Golding and Widdies, A. H. Wheeler and Co. Ltd.
2. A Course in Electrical and Electronic measurements and Instrumentation – by A. K. Sawhney, Dhanpat Rai and Sons.
3. Mikell P. Groover, Automation, Production Systems, and Computer-integrated Manufacturing, prentice Hall.

Useful Links

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1.	http://www.journals.elsevier.com/flow-measurement-and-instrumentation/
2.	http://www.irsst.qc.ca/en/publications-and-tools/useful-links/category/c/19/n/measurement-and-instrumentation
3.	https://nptel.ac.in/courses/108/105/108105063/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3304: DC Machines and Transformer(Multi-disciplinary Minor - 01)				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	02		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Basic of Electrical engineering

Course Outcomes (CO): Students will be able to

CO1	Acquire knowledge about constructional details of DC generator
CO2	Understand the concept of DC Motor
CO3	Acquire knowledge about constructional details of single-phase transformer
CO4	Understand the concept of different type transformers

	Course Contents	CO	Hours
Unit 1	**DC generator:** Constructional details of dc machines - armature winding- single layer winding, double layer winding- lap and wave principle of operation, EMF equation, excitation, armature reaction demagnetizing and cross magnetizing ampere turn, compensating windings, interpoles, commutation, voltage build up and load characteristics, parallel operation. Power flow diagram	**CO1**	**(10)**
Unit 2	**DC Motor:** Types, back emf, generation of torque, torque equation, performance characteristics, Starting of dc motors- starters 3-point and 4-point starters (principle only). Speed control of dc motors - field control, armature control. Braking of dc motors. Power flow diagram – losses and efficiency, applications	**CO2**	**(08)**
Unit 3	**Single phase Transformer**: working principle, types of Transformer, construction, EMF equation, Phasor diagrams, Voltage regulation of a Transformer, Losses in a transformer, Efficiency of a Transformer, Condition for maximum efficiency, All day efficiency, Application	**CO3**	**(07)**
Unit 4	**Three–phase Transformer**: Advantages of three phase Transformer, Principle of operation, Construction of three phase transformers, three–phase transformer connections, Rating of Transformers, Potential transformer, Current transformer, Autotransformer: Autotransformer Working, Advantages of Autotransformer over Two winding Transformer, application	**CO4**	**(09)**

Text Books

1. Kothari D.P, Nagrath I.J., Electric Machines, TMH Publications, 4th Edition
2. Dr. Bimbhra P.S., "Electric Machinery", Khanna Publisher, Fifth Edition
3. B. L. Theraja, Electrical Technology Vol II,S.Chand Publications.

Reference Books

1. Deshpande M. V., Electrical Machines, Prentice Hall India, New Delhi
2. Irving L Koskow, Electric Machinery and transformer, 2nd Edition, Prentice Hall Indi

Useful Links

1. NPTEL :: Electrical Engineering - Electrical Machines -I
2. https://nptel.ac.in/courses/108102146

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	-

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1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
Open Elective-I – EE3315: Sustainable Energy Systems				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : semiconductor physics

Course Outcomes (CO): Students will be able to

CO1	Understand the Need, importance, and scope of non-conventional energy resources.
CO2	Apply the site selection ideas for practical implementation and use of RES.
CO3	Analyze the performance of RES in practice.
CO4	Evaluate various performance indices of RES in practice.

	Course Contents	CO	Hours
Unit 1	**Introduction to Sustainable Energy System:** Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.	**CO1**	**(04)**
Unit 2	**Wind Energy:** Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, wind speed & velocity, towers, Applications of wind energy.	**CO2**	**(06)**
Unit 3	**Solar PV and thermal systems:** Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds - Thermal Energy storage system with PCM- Solar Photovoltaic systems: Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array, PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.	**CO2, CO3**	**(08)**
Unit 4	**Biomass Energy:** Introduction, biomass categories, biofuels. Introduction to biomass conversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen-Bandhu biogas plant, Pragati design biogas plant. Utilization of biogas. Energy plantation. Alternative liquid fuels – ethanol and methanol. Ethanol production	**CO2**	**(07)**
Unit 5	**Geothermal Energy:** Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India.	**CO2, CO3**	**(07)**
Unit 6	**Other Energy Sources:** Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC) - Hydrogen Production and Storage- Fuel cell: Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.	**CO2, CO4**	**(08)**

Text Books

1. B. H. Khan, Non-Conventional Energy Resources, , The McGraw Hill
2. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
3. D.P.Kothari, K.C Singal, RakeshRanjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.

Reference Books

1. Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India.
2. K. M. Mittal, "Non-Conventional Energy Systems", A H WheelerPublishing Co Ltd
3. G.D. Rai, "Non-conventional Energy sources", Khanna Publishers.

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4.	BansalKeemann, Meliss, "Renewable energy sources and conversion technology", Tata McGraw Hill.
5.	Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, Wiley-IEEE Press.
6.	Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd.
Useful Links	
1.	https://nptel.ac.in/courses/103/107/103107157/
2.	https://nptel.ac.in/courses/108/105/108105058/
3.	https://nptel.ac.in/courses/108/108/108108078/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	1
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	1
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	1
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	1

1: Slight (Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad					
Second Year (Sem – III) B. Tech. Electrical Engineering					
EE3325-OE I -(MOOC) Energy Systems Engineering					
Teaching Scheme				**Examination Scheme**	
Lectures	-			ISE	-
Tutorials	-			ESE	100
Total Credits	02				

Course Outcomes (CO): Students will be able to

CO1	Understand the Need, importance, and scope of non-conventional energy resources.
CO2	Apply the site selection ideas for practical implementation and use of RES.
CO3	Analyze the performance of RES in practice.
CO4	Evaluate various performance indices of RES in practice.

Course Contents

Students should complete the MOOC course certification in the domain of Energy Systems Engineering and submit a copy of the certificate to Head of Department prior to ESE.

Guidelines:

- Selection of the MOOC course should be with the prior permission of Head of Department
- Duration for completion of MOOC course certification is minimum 8 Weeks.
- Platform: NPTEL or SWYAM only
- Assessment Guideline:- The evaluation of the MOOC Course will be based on at actual score secured by the student in NPTEL or SWAYAM course certification and it will be converted to ESE score.
- If the student unable to submit the NPTEL or SWAYAM completion Certificate, in such cases evaluation will be based on assignment score (60% weightage) of registered NPTEL/SWAYAM and internal evaluation (40 % weightage).
- The rubrics for internal evaluation are given below.

Government College of Engineering, Karad

Department of Electrical Engineering

A. Y. 2024-25

Course Code : **Assessment Sheet** **Class:**

Course Title :-

Sr No.	Reg. No	Name of Student	Course Title	Knowledge of Course (08 Marks)	Communication Skill (08 Marks)	Presentation Skill (08 Marks)	Content (08 Marks)	Q & A (08 Marks)	Total Marks (out of 40)
1									
2									

Guide Name and Sign. **Head of the Department**

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Electrical Engineering Department

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3306: Universal Human Values				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	--
Tutorials	00 Hrs/week		ISE	50
Total Credits	02		ESE	--
			Duration of ESE	--

Prerequisite : First year Induction program

Course Outcomes (CO): Students will be able to

CO1	Understand and recall a holistic perspective on life and profession, grounded in Universal Human Values.
CO2	Apply holistic understanding to authentic situations, and implications for ethical conduct with Nature.
CO3	Analyse, evaluate connections between a holistic perspective, ethical conduct, & transformative impact on behaviour.
CO4	Evaluate the course's impact ,proficiency in applying Universal Human Values across diverse contexts.

	Course Contents	CO	Hours
Unit 1	**Introduction to Value Education:** Right understanding, relationship, and physical facility (holistic development and the role of education), understanding value education, self-exploration as the process for value education.	**CO1**	**(03)**
Unit 2	**Fundamental Human Aspirations:** Continuous happiness and prosperity – the basic human aspirations, happiness and prosperity – current scenario, method to fulfil the basic human aspirations.	**CO2**	**(03)**
Unit 3	**Harmony between Self and Body:** 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.	**CO2**	**(06)**
Unit 4	**Values in Human Interaction:** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship.	**CO3**	**(04)**
Unit 5	**Society, Universal Order, and Nature:** Understanding Harmony in the Society, Vision for the Universal Human Order, 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. (**Self Study**: The Holistic Perception of Harmony in Existence.)	**CO2, CO3**	**(06)**
Unit 6	**Ethical Conduct and Professional Transition:** 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, (**Self Study**: Strategies for Transition towards Value-based Life and Profession)	**CO4**	**(06)**

Text Books

1. R. R. Gaur, R. Asthana, G. P. Bagaria, "The Textbook A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1 (Unit: 1,2,3,4,5,6)
2. R. R. Gaur, R. Asthana, G. P. Bagaria, "The Teacher's Manual Teachers: Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2. (Unit: 1,2,3,4,5,6)

Reference Books

1. D R Kiran , "Professional ethics and human values", McGraw Hill Education (India) Private Limited P-24, 2nd edition, 2014, Green Park Extension, New Delhi 110 016
2. V. Jayakumar, "Professional ethics and Human values in Engineering"
3. Rudolf Steiner, "Human Values in Education (The Foundations of Waldorf Education, 20)", Anthroposophic

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	Press, Year: 2004, ISBN: 0880105445,9780880105446
4.	R.S. Naagarazan, "A Textbook on Professional Ethics and Human Values", New Age International Pvt Ltd Publishers, Year: 2007 ISBN: 8122419380,9788122419382,9788122423013
Useful Links	
1.	https://nptel.ac.in/courses/109104068 Exploring Human Values: Visions of Happiness and Perfect Society, IIT Kanpur, Prof. A.K. Sharma
2.	https://onlinecourses.nptel.ac.in/noc23_hs89/preview Moral Thinking: An Introduction To Values And Ethics, By Prof. Vineet Sahu IIT Kanpur
3.	https://uhv.org.in/course Universal Human Values

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	-	1	-	1	1	2	2	1	2	-	2	-	-
CO 2	-	-	-	-	-	3	3	-	3	-	3	2	-
CO 3	1	-	2	1	2	3	2	-	3	1	2	1	1
CO 4	-	1	1	-	-	2	3	2	2	1	3	-	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	5	-
Understand	-	5	-
Apply	-	15	-
Analyse	-	10	-
Evaluate	-	15	-
Create	-	-	-
TOTAL	-	50	-

BoS Charmain

Electrical Engineering Department

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

CHAIRMAN Board of Studies Department Of Electrical Engineering Government College of Engineering, Karad

Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3307 : Economics for Engineer				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	50
Total Credits	02		ESE	-

Prerequisite : Basic knowledge of mathematics and economics

Course Outcomes (CO): Students will be able to

CO1	Identify the need, usage and importance of an information system to an organization.
CO2	Understand the basic concepts of economics, micro and macro economics.
CO3	Analyse the different strategies beneficial for industrial economics.
CO4	Apply the personal economics methods in our day to day life to gain personal financial control.

	Course Contents	CO	Hours
Unit 1	**Basic of Information system and management:** Role of Information Systems in Organizations, The Information System Manager and his challenges, Concepts of Information Systems, Information Systems and Management Strategy Case Studies - Information Systems in the Indian Railways, Information Systems in an ecommerce Organization.	**CO1**	**(05)**
Unit 2	**Basic Concepts of Economics:** Definitions, Overview of Micro and Macro Economics, Explanation of theories of demand, supply and market equilibrium and Economics Basics – Cost, efficiency and scarcity, Opportunity Cost, (**Self-Study**: Use of IT in economics)	**CO2**	**(05)**
Unit 3	**Micro and Macro Economics:** Micro economics: Differences and Comparison, Theories of Utility and Consumers Choice,Competition and Market Structures, Macro Economics: Aggregate Demand and Supply, Economic Growth and Business Cycles, Therole of the Nation in economic activity	**CO2**	**(05)**
Unit 4	**Industrial Economics:** Behaviour of firms: Strategies with regard to entry, pricing, advertising, and R & D and innovation. The development of Firms and Market and Industrial Structure: Stochastic models of firm growth, and market structure.	**CO3**	**(05)**
Unit 5	**Cash Flow:** Accounting for Depreciation and Income Taxes, Project Cash-Flow Analysis, Understanding Financial Statements, Case Studies - cash flow analysis done in start-up companies.	**CO4**	**(04)**
Unit 6	**Personal Economics:** Compound Interest and Credit, Financial Markets, Human Capital and Insurance, Money Management/ Budgeting, Risk and Return, Saving and Investing, (**Self-Study**: Role of IT in financial market, IT economics and data mining in stock market).	**CO4**	**(04)**

Text Books

1. Rahul De, "MIS: Management Information Systems in Business, Government and Society", Wiley India, ISBN:13: 978-81-265-2019-0. (Unit: 1)
2. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.(Unit: 5)
3. Hay, Donald A., Derek J. Morris, "Industrial Economics and Organization: Theory and Evidence", 2nd Edition(Oxford: Oxford University Press), 1991. (Unit: 4)
4. Varian, Hal, " Intermediate Microeconomics: A Modern Approach", Norton, 5th Edition, 1999.(Unit: 3)
5. Baumol, William J., "Economic Theory and Operations Analysis", Prentice Hall India Ltd.,4th Edition, 1985. (Unit:2)
6. Rachel Siegel, Carol Yacht, "Personal finance", Publisher Saylor Foundation ISBN 13: 9780982361863, 2009.(Unit: 6)

Reference Books

1. R.J. Gordon, "Macroeconomics", Little Brown& Co. Boston, 4th Edition,1987.
2. Donald G. Newman, Jerome P. Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2010.

Useful Links

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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1.	https://nptel.ac.in/courses/112/107/112107209/ Dr. P. K. Jha IIT Roorkee
2.	https://nptel.ac.in/courses/109/104/109104073/ Dr. S. Sinha IIT Kanpur
3.	https://www.econlib.org/library/Topics/HighSchool/HighSchoolTopics.html#finance

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	-	3	-	-	-	2	1	2	1	2	1	1	-
CO 2	2		-	-	-	2	1	2	1	2	1	1	-
CO 3	1	3	-	-	-	2	1	2	1	2	1	1	-
CO 4	-	-	-	3	-	2	1	1	2	1	1	1	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	05	-
Understand	-	15	-
Apply	-	10	-
Analyse	-	20	-
Evaluate	-	-	-
Create	-	-	-
TOTAL	-	50	-

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3308: DC Machines and Transformer Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		ISE	50
Total Credits	01		ESE	25

Prerequisite : Basic Electrical Engineering

Course Outcomes (CO): Students will be able to

CO1	Apply appropriate experimental setup for performance evaluation of machines.
CO2	Understand various tests on DC machines
CO3	Understand various tests on Transformer
CO4	Interpret obtained results to reach appropriate conclusion

Course Contents		CO
Implementation of following concepts		
Experiment 1	O.C.C. on Separately Excited DC generator	**CO1,CO2,CO4**
Experiment 2	Load test on DC Shunt Motor	**CO1,CO2,CO4**
Experiment 3	Load test on DC Series Motor	**CO1,CO2,CO4**
Experiment 4	Speed Control of DC Shunt Motor (Armature and Field Control)	**CO1,CO2,CO4**
Experiment 5	Swinburne's Test	**CO1,CO2,CO4**
Experiment 6	Hopkinson's Test	**CO1,CO2,CO4**
Experiment 7	To Find equivalent circuit parameters from O.C and S.C Test on single phase Transformer	**CO1,CO3,CO4**
Experiment 8	Sumpner's Test on single phase transformer	**CO1,CO3,CO4**
Experiment 9	Load test on single phase transformer	**CO1,CO3,CO4**
Experiment 10	Scott connection	**CO1,CO3,CO4**
Experiment 11	Parallel operation of single-phase transformer	**CO1,CO3,CO4**
Experiment 12	To separate core losses of single-phase transformer at no-load.	**CO1,CO3,CO4**
List of Submission:		
	Minimum number of Experiments: 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	1	-	-	-	1	1	2	-	-	-	1	-
CO 2	1	-	1	-	1	1	1	1	-	-	-	2	-
CO 3	1	-	1	1	1	1	-	-	-	-	-	1	-
CO 4	1	2	-	2	1	1	1	1	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE 3309 :Measurements and Instrumentation Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		ISE	50
Total Credits	01		ESE	25

Prerequisite : Mathematics, Network Components

Course Outcomes (CO): Students will be able to

CO1	Learn about various measurement devices, their characteristics, their operation and their limitations.
CO2	Design and validate DC and AC bridges.
CO3	Understand the principles of operation and characteristics of instrumentation and integrated sensor systems.
CO4	Apply proper method, sensors and transducers for specific applications and measurement.

Course Contents		CO
Implementation of following concepts		
Experiment 1	Study of various analog measuring instruments and demonstration of working parts of various types of meter by opening the instrument and explanation of symbols and notations used on instruments.	**CO1**
Experiment 2	Measurement of Active and reactive power in three phase circuit using two wattmeter method (Balanced and Unbalanced Loads).	**CO2**
Experiment 3	Calibration of Single phase energy meter at different power factors.	**CO2**
Experiment 4	Measurement of Reactive Power by one wattmeter with all possible connections of current coil and pressure coil.	**CO3**
Experiment 5	Measurement of R, L & C using appropriate bridge as well as LCR meter	**CO3**
Experiment 6	Identification of a temperature sensor from the list, which has minimum response time. (Thermocouple, RTD and Thermistor).	**CO3**
Experiment 7	Implementation of Virtual instrumentation for energy, power, power factor measurement	**CO3**
Experiment 8	Study of DSO control panel and its specifications. Implement applications of DSO.	**CO3**
Experiment 9	Design and implementation of DAC using R-2R ladder network.	**CO4**
Experiment 10	Study of Bosch sensor applications.	**CO4**
	Minimum number of Experiments : 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	-	-	1	-	1	-	-	-	-	-	-	-
CO 2	1	2	-	1	-	1	-	-	-	-	-	1	-
CO 3	-	1	3	2	1	1	-	-	-	-	-	2	-
CO 4	-	1	2	3	-	1	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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Electrical Engineering Department

Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
Open Elective – 01 EE3316 : Sustainable Energy Systems Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	25

Prerequisite : Computer fundamentals

Course Outcomes (CO): Students will be able to

CO1	Understand the solar resource and utilization of solar thermal energy
CO2	Improve the quality of Solar PV system installations, especially in the rooftop solar segment
CO3	Understand how to estimate available solar energy for a given site and application
CO4	Improve the understanding of the wind energy concepts and the application of general

Course Contents		CO
Implementation of following concepts		
Experiment 1	To demonstrate the I-V and P-V characteristics of PV module with varying radiation and temperature level.	**CO1**
Experiment 2	To demonstrate the I-V characteristics of series and parallel combination of PV module.	**CO2**
Experiment 3	To show the effect of variation in tilt angle of PV module.	**CO2**
Experiment 4	To demonstrate the effect of shading on module output power.	**CO3**
Experiment 5	To demonstrate the working of diode as bypass diode and blocking diode.	**CO3**
Experiment 6	Workout power flow calculations of stand-alone PV system with DC load and battery.	**CO3**
Experiment 7	Workout power flow calculations of stand-alone PV system with AC load and battery.	**CO3**
Experiment 8	To draw the charging and discharging characteristics of battery.	**CO3**
Experiment 9	Evaluate the efficiency of charge controller.	**CO4**
Experiment 10	Find out the start up speed and cut-in speed of wind turbine experimentally.	**CO4**
Experiment 11	Evaluate the tip speed ratio at different wind speeds	**CO4**
Experiment 12	Draw the power curve of turbine with respect to rotational speed of rotor at fix wind speeds.	**CO4**
List of Submission:		
	Minimum number of Experiments : 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	-	-	1	-	1	-	-	-	-	-	-	-
CO 2	1	2	-	1	-	1	-	-	-	-	-	1	-
CO 3	-	1	3	2	1	1	-	-	-	-	-	2	-
CO 4	-	1	2	3	-	1	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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Electrical Engineering Department

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Avg
Task I	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25

DEPARTMENT OF ELECTRICAL ENGINEERING
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Year
GCE KARAD

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Government College of Engineering, Karad

Government College of Engineering, Karad				
Second Year (Sem – III) B. Tech. Electrical Engineering				
EE3326-OE I -(MOOC) Energy Systems Engineering Lab				
Teaching Scheme			**Examination Scheme**	
Lectures	-		ISE	25
Tutorials	-		ESE	25
Total Credits	01			

Course Outcomes (CO): Students will be able to

CO1	Relate the solar resource and utilization of solar thermal energy
CO2	Teach the quality of Solar PV system installations, especially in the rooftop solar segment
CO3	Correlate the available solar energy for a given site and application
CO4	Categorize the wind energy concepts and the application of general

Course Contents

Students should complete the MOOC course certification in the domain of Energy Systems Engineering and submit a copy of the certificate to Head of Department prior to ESE.

Guidelines:

- For Open Elective Lab course conducted in online mode (MOOC), assessment may be done in line with course undertaken in MOOC. Assessment method should be decided by concerned BoS.

General Instruction:

- Course coordinator will decide the suitable assessment method for internal evaluation of 25 marks and for ESE Evaluation of 25 marks based on presentation conducted by Panel of minimum two internal faculty members for the course completion.

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3401: AC Machines				
Teaching Scheme			**Examination Scheme**	
Lectures	03Hrs/week		MSE	20
Tutorials	00Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Basic of Electrical Engineering, DC Machines and Transformer

Course Outcomes (CO): Students will be able to

CO1	Understand the concept of AC machines and their industrial applications
CO2	Apply the concept of equivalent circuit of machines in different application
CO3	Analyse the numerical methods in ac machines
CO4	Evaluate the performance analyses of different AC machines

	Course Contents	CO	Hours
Unit 1	**Three phase Induction Motor** Construction & types of 3 ph. Induction motors, torque equation, starting torque, running torque, condition of maximum torque ,torque slip characteristics, Need of starters for 3 phase Induction motors, types of starters, Speed control methods from stator side (Stator voltage control ,Stator Frequency control, Pole changing) & rotor side (rotor resistance control), Applications of 3 ph. Induction motors.	**CO1**	**(08)**
Unit 2	**Equivalent circuit analysis of three phase induction motor** Losses & efficiency of 3 phase induction motor, power flow diagram with numerical treatment, No load & blocked rotor test, equivalent circuit of 3 phase induction motor, Phasor diagram of 3 phase induction motor, performance of 3 phase induction motor using circle diagram, Cogging & crawling of 3 phase induction motor.	**CO3**	**(07)**
Unit 3	**Single Phase Induction Motor** Construction, Working and types of single phase induction motors (Split phase, capacitor start/run, shaded pole motors), Double field revolving theory, Characteristics & Applications.	**CO1**	**(05)**
Unit 4	**Alternator** Construction, principle of operation of three phase alternator, emf equation, parameters of armature winding, armature reaction, concept of synchronous reactance and synchronous impedance. Equivalent circuit of 3 phase alternator, alternator on load (resistive, inductive &capacitive)	**CO1**	**(07)**
Unit 5	**Equivalent circuit analysis of Alternator** OC test & SC test on 3 Phase alternator, short circuit ratio, voltage regulation methods (emf, mmf, zero power factor and direct loading method) with numerical treatment, Losses and efficiency, power flow diagram, need of parallel operation, conditions for parallel operation, synchronizing procedures, hunting and oscillations in alternators.	**CO2, CO4**	**(06)**
Unit 6	**Synchronous motor** Synchronous motor, starting methods, Phasor Diagram, Effect of excitation on power factor and armature current, V and inverted V Curves, Operation of Synchronous motor as Synchronous Condenser, Applications of three phase synchronous motor. Permanent Magnet Machines, Principle, operation and applications of Brushless motors	**CO4**	**(07)**

Text Books

1. "Electrical Machines", S. K. Bhattacharya, 3rd edition, Tata Mc-Graw-Hill publication.
2. "Electrical Machines", I. J. Nagrath, D. P. Kothari, 4th edition, Tata McGraw Hill publication

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Electrical Engineering Department

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Reference Books	
1.	"Electric Machinery", A. E. Fitzgerald, Mc-Graw Hill publications
2.	"Theory of AC machines", A. S. Langsdorf, Mc-Graw Hill publications.
3.	"Design of Brushless Permanent Magnet motors,"J. R. Hendershot and T. J. E. Miller, Magna Physics Publishing and Clarendon press. 1994edition.
4.	"Brushless Permanent Magnet Motor Design", Duane C. Hanselman, McGraw- Hill Inc.
Useful Links	
1.	www.nptel.iitm.ac.in (Video Courses on Electrical Machines by Prof. S K Bhattacharya, IIT Kharagapur)

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	1	-
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember			
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	10
Create	-	-	-
TOTAL	20	20	60

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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Department Of Electrical Engineering
Government College of Engineering, Karad

Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3402: Analog and Digital Electronics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	03		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Basic Electronics engineering, AC & DC circuits, Numbering system, Logic Gates and flip flops, Diode and BJT

Course Outcomes (CO): Upon successful completion of this course, the students will be able to:-

CO1	Design logical, sequential, and combinational digital circuit using K-Map.
CO2	Demonstrate different digital memories and programmable logic families.
CO3	Apply and analyze applications of OPAMP in open and closed loop condition.
CO4	Design uncontrolled rectifier with given specifications

	Course Contents	CO	Hours
Unit 1	**Operational Amplifier Applications:** Open loop and close loop configuration of Op-Amp. Applications of Op- Amp- zero crossing detectors, Comparator, Schmitt trigger, V-I and I-V converters, Instrumentation amplifier, peak detector, Waveform generation using Op-amp - sine, square, saw tooth and triangular generator,	**CO1**	**(07)**
Unit 2	**Other Analog circuits:** Active filters-Its configuration with frequency response, Analysis of first order low pass and high pass filters using OPAMP, IC 555 –construction, working and modes of operation- a stable and monostable multi vibrators, Sequence generator, voltage regulators using IC78xx, 79xx, LM 317	**CO1**	**(07)**
Unit 3	**Diode rectifier:** Single phase half wave rectifier with R, RL loads. Single phase full wave rectifier-Center tap and bridge rectifier supplying R and RL load and performance parameters. Three phase full wave bridge rectifier with R load.	**CO2**	**(06)**
Unit 4	**Design of combinational circuit:** Booleans algebra, De-Morgan theory etc, Karnaugh map: structure for two, three and four Variables, SOP and POS form reduction of Boolean expressions by K-map. Design of combinational circuits using Boolean expression and K-map, encoder, decoder, half, and full adder.	**CO2**	**(07)**
Unit 5	**Design of sequential circuit:** Introduction to sequential circuit. Design of synchronous (K-map) and asynchronous counters. Up down counters, N modulo counters, Shift registers, ring, and twisted ring counters	**CO2, CO3**	**(07)**
Unit 6	**Digital memories and logic families:** A) Digital memories: SRAM, DRAM, ROM, EPROM B) Digital logic families: PAL, PLA, CPLD, FPGA	**CO4**	**(06)**

Text Books

1. [T1] Floyd and Jain, "Digital Fundamentals", Pearson Education.
2. [T2] R. P. Jain, "Digital Electronics", Tata McGraw Hill, New Delhi.
3. [T3] Gaikwad R., "Operational Amplifier", PHI New Delhi.
4. [T4] Floyd, "Electronics Devices", Pearson Education.
5. [T5] Mottershed, "Electronics Devices & Circuits", PHI New Delhi
6. [T6] Fundamental of digital circuits, 4th Edition, by A Anand Kumar, PHI learning private limited publication

Reference Books

1. [R1] Tokheim, "Digital Electronics-Principles and Application", 6th edition, Tata McGraw Hill, New Delhi
2. [R2] A Jaico and Charles H. Roth, "Fundamentals of Logic Design" Jr. Forth Edition.
3. [R3] K. R. Botkar, "Integrated Circuits", Khanna Publication, New Delhi.

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4.	[R4] James, "Operational Amplifier and Linear Integrated Circuits Theory and Application."
5.	[R5] P John Paul, "Electronics Devices and circuits", New Age international Publications.
6.	[R6] P. S. Bimbhra, "Power Electronics", Khanna Publications.
Useful Links	
1.	NPTEL course on Digital Electronics Circuit, IIT, Kharagpur. https://nptel.ac.in/courses/108105132/
2.	NPTEL course on Integrated circuit, MOSFET, OPAMP and their applications IISC Bangalore. https://nptel.ac.in/courses/108/108/108108111/
3.	NPTEL course on power electronics by IIT Kharagpur. https://nptel.ac.in/courses/108/105/108105066/

UNIT No	Textbook	Reference book
1	T4, T5	R3, R4, R6
2	T4, T5	R3, R4, R6
3	T6	R6, L3
4	T1, T2, T6	R1, R6
5	T1, T2, T4, T6	R2, L1
6	T6	L1

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	1
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3403: Power Electronics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		MSE	20
Tutorials	01 Hrs/week		ISE	20
Total Credits	04		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Basic Electronics Engineering

Course Outcomes (CO): Students will be able to

CO1	Apply the basic knowledge of Power Electronics for practical implementation
CO2	Analyze switching circuits & gate drive circuits for control of power switches.
CO3	Analyze functioning and design process of various Power Electronics converters.
CO4	Understand various PWM techniques for inverter.

	Course Contents	CO	Hours
Unit 1	**Introduction to Power Electronics:** Applications of Power Electronics in various sectors, Power Electronics Structure (how it differs from low power analog electronics) Power Electronics Switches: Basic construction, characteristics, commercial ratings, integrated power modules (IPM), study of modules / power switches available in commercial market.	**CO1**	**(04)**
Unit 2	**Analysis of switching circuits:** Gate Drive Circuits: Requirements of gate drive, Gate drive circuits for various power switches (transistor, MOSFET, IGBT etc), study of gate drivers available in commercial market.	**CO2**	**(04)**
Unit 3	**AC-DC Converters:** Uncontrolled Rectifiers: 1-ph, 3-ph, rectifiers, control techniques, analysis with R-L-E load, numerical, applications in practice Controlled Rectifiers: 1-ph, 3-ph, rectifiers, control techniques, analysis with R-L-E load, numerical, applications in practice Dual Converters, applications of various converters in practice Effect of source impedance on performance of converters	**CO3**	**(12)**
Unit 4	**DC-DC Converters:** Non-isolated DC-DC Converters: Buck, Boost, Buck-Boost, Cuk converters and analysis, Introduction to modified DC-DC converters Isolated DC-DC Converters, Applications of DC-DC converters in practice Introduction: Modified DC-DC converters	**CO3**	**(06)**
Unit 5	**AC-AC Converters:** 1-ph, 3-ph converters, control techniques, applications, introduction to matrix converters	**CO3**	**(02)**
Unit 6	**DC-AC Converters:** Classifications of inverters, 1-ph, 3-ph VSI and CSI, Control (modulation) techniques of VSI (e.g., SPWM, SVPWM, Simple Harmonic Elimination etc.) Introduction to Multilevel inverters (MLI) and control techniques (SPWM)	**CO4**	**(14)**

Text Books

1. Power Electronics: Circuits Devices and Applications, M. H. Rashid, 3rd Edition, Pearson/Prentice Hall Publications
2. Power Electronics Converters, Applications and Design, Ned Mohan, 3rd edition, Jonh Wiley and Sons.

Reference Books

1. Power Electronics: Principles and Applications, Joseph Vithayathil, McGraw Hill Publication, 2010
2. Power Electronics, Cyril W. Lander, 3rd Edition McGraw Hill publication
3. Pulse Width Modulation for Power Converters: Principles and Practice, D. G. Holmes, Thomas A. Lipo, IEEE press, Wiley interscience, Jonh Wiley and Sons Inc. Pub.

Useful Links

1. https://nptel.ac.in/courses/108/101/108101038/ (Prof. B. G. Fernandes)
2. https://nptel.ac.in/courses/108/101/108101126/ (Prof. L. Umanand)

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3.	https://nptel.ac.in/courses/108/102/108102145/ (Prof. G. Bhuvaneshwari)
4.	https://nptel.ac.in/courses/108/107/108107128/ (Prof. Avik Bhattacharya)

Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO
CO 1	3	1	3	2	1	-	-	-	-	-	2	3	-
CO 2	3	2	3	3	-	2	-	-	-	-	3	2	-
CO 3	3	3	3	3	3	1	-	-	1	-	3	2	-
CO 4	3	1	3	2	2	-	-	-	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3404: AC Machines(Multi-disciplinary Minor - 02)				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	02		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Basic of Electrical engineering

Course Outcomes (CO): Students will be able to

CO1	Utilize the concept of AC machines and their industrial applications
CO2	Analyse the equivalent circuit of machines in different application
CO3	Acquire knowledge about constructional details of single-phase Induction motor
CO4	Evaluate the performance analyses of different AC machines

	Course Contents	CO	Hours
Unit 1	**Three phase Induction Motor** Construction & types of 3 ph. Induction motors, torque equation, starting torque, running torque, condition of maximum torque ,torque slip characteristics, Need of starters for 3 phase Induction motors, types of starters, Speed control methods from stator side (Stator voltage control ,Stator Frequency control, Pole changing) & rotor side (rotor resistance control), Applications of 3 ph. Induction motors.	**CO1**	**(10)**
Unit 2	**Equivalent circuit analysis of three phase induction motor** Losses & efficiency of 3 phase induction motor, power flow diagram with numerical treatment, No load & blocked rotor test, equivalent circuit of 3 phase induction motor, Phasor diagram of 3 phase induction motor, performance of 3 phase induction motor using circle diagram, Cogging & crawling of 3 phase induction motor.	**CO2**	**(08)**
Unit 3	**Single Phase Induction Motor** Construction, Working and types of single phase induction motors (Split phase, capacitor start/run, shaded pole motors), Double field revolving theory, Characteristics & Applications.	**CO3**	**(07)**
Unit 4	**Synchronous motor** Synchronous motor, starting methods, Phasor Diagram, Effect of excitation on power factor and armature current, V and inverted V Curves, Operation of Synchronous motor as Synchronous Condenser, Applications of three phase synchronous motor. Permanent Magnet Machines, Principle, operation and applications of Brushless motors	**CO4**	**(09)**

Text Books

1.	"Electrical Machines", S. K. Bhattacharya, 3rd edition, Tata Mc-Graw-Hill publication.
2.	"Electrical Machines", I. J. Nagrath, D. P. Kothari, 4th edition, Tata McGraw Hill publication

Reference Books

1.	"Electric Machinery", A. E. Fitzgerald, Mc-Graw Hill publications
2.	"Theory of AC machines", A. S. Langsdorf, Mc-Graw Hill publications.
3	"Design of Brushless Permanent Magnet motors,"J. R. Hendershot and T. J. E. Miller, Magna Physics Publishing and Clarendon press. 1994edition.

Useful Links

1.	www.nptel.iitm.ac.in (Video Courses on Electrical Machines by Prof. S K Bhattacharya, IIT Kharagapur)

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
Open Elective – 02: EE3417: Robotics and Automation				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	20
Tutorials	00 Hrs/week		ISE	20
Total Credits	02		ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Linear Algebra, Basic Electronics, Problem Solving

Course Outcomes (CO): Students will be able to

CO1	Identify and classify various types of industrial robots.
CO2	Illustrate the power transmission system for robot drive.
CO3	Decide gripper and sensor for specific applications.
CO4	Develop programming principles and languages for a robot control system.

	Course Contents	CO	Hours
Unit 1	**Introduction to Robot and automation: Automation:** Types of automation, Robotics in automation, Definition of robot, history of Robotics, law of robotics, Components and Terminology of Robotics., Wrist Mechanism, Degrees of freedom, of a robot, Classification of Robots, Specifications of robot, Application of Robotics.	**CO1**	**(06)**
Unit 2	**Robot Drive and Power transmission Systems:** Introduction of drive system, structure of drive system, Necessity of drive system, Characteristics of Actuating Systems, design consideration of drive system, Hydraulic and Pneumatic Systems, Electrical Actuation System, Advantages and limitations of drive system. Power transmission Systems (Gear, Belt, Chains etc.)	**CO2**	**(06)**
Unit 3	**Robotic sensor system:** Need of sensor, Sensor Performance Characteristics, Position sensors Velocity sensors, Accelerometers, Touch sensor, Slip sensors, Wrist Sensors, Vision sensors, Force sensor, Torque sensor, Tactile sensor,	**CO3**	**(04)**
Unit 4	**Control system of robot and End effectors:** Basic control systems concepts and models, Types of Controllers, feedback components, Adaptive control system, Design Considerations of End Effectors, Basic types of End Effectors, Gripper classification,	**CO3**	**(04)**
Unit 5	**Kinematics of Robot Manipulator:** Co-ordinate and vector transformation using matrices, Rotation matrix, Inverse Transformations, Problems, Composite Rotation matrix, Homogenous Transformations, Robotic Manipulator Joint Coordinate System, Euler Angle & Euler Transformations, Roll Pitch-Yaw (RPY) Transformation,	**CO4**	**(05)**
Unit 6	**Robot Programming:** Introduction to robot programming, Programming Types (Flex Pendant, Lead through programming), Interlock commands- Operating mode of robot, Jogging-Types, Motion commands, end effectors and sensors commands. VAL Programming, programming-basic commands, motion control, hand control, program control, pick and place applications, palletizing applications using VAL.	**CO4**	**(05)**

Text Books

1. M.P. Groover, M. Weiss, R.N. Nagel, N.G. Odrey, "Industrial Robotics", Tata McGraw Hills Publication, Second Edition, 2017.
2. Richard D Klafter, Thomas A Chmielewski, Michael Negin, —Robotics Engineering: An Integrated Approach‖, PHI Learning, New Delhi, 2009.

Reference Books

1. Thomas R. Kurfess, "Robotics and Automation Handbook", CRC Press, 1st edition, 2005.
2. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis ', Oxford University Press, Sixth impression, 2010.
3. Robert J. Schilling, —Fundamentals of Robotics Analysis and Control‖, PHI Learning, 2011.

Useful Links

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1.	https://nptel.ac.in/courses/112/105/112105249/- I.I.T, Kharagpur.
2.	https://see.stanford.edu/Course/CS223A - Stanford University, Stanford, California.
3.	http://nptel.ac.in/courses/112101099 - I.I.T, Bombay

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-
CO 2	-	3	1	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	2	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3427-OE II -(MOOC) Power System Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	-		ISE	-
Tutorials	-		ESE	100
Total Credits	02			

Course Outcomes (CO): Students will be able to

CO1	Relate and classify various types of electricity generating units.
CO2	Discover the ideas about power transmission system.
CO3	Conclude about different parameters in transmission and distribution system.
CO4	Appraise modern power system protection system.

Course Contents

Students should complete the MOOC course certification in the domain of Power System Engineering and submit a copy of the certificate to Head of Department prior to ESE.

Guidelines:

- Selection of the MOOC course should be with the prior permission of Head of Department
- Duration for completion of MOOC course certification is minimum 8 Weeks.
- Platform: NPTEL or SWYAM only
- Assessment Guideline:- The evaluation of the MOOC Course will be based on at actual score secured by the student in NPTEL or SWAYAM course certification and it will be converted to ESE score.
- If the student unable to submit the NPTEL or SWAYAM completion Certificate, in such cases evaluation will be based on assignment score (60% weightage) of registered NPTEL/SWAYAM and internal evaluation (40 % weightage).
- The rubrics for internal evaluation are given below.

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Department of Electrical Engineering

A. Y. 2024-25

Course Code : **Assessment Sheet** **Class:**

Course Title :-

Sr No.	Reg. No	Name of Student	Course Title	Knowledge of Course (08 Marks)	Communication Skill (08 Marks)	Presentation Skill (08 Marks)	Content (08 Marks)	Q & A (08 Marks)	Total Marks (out of 40)
1									
2									

Guide Name and Sign. **Head of the Department**

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3406 : Strategic Management				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	50
Total Credits	02		ESE	-

Prerequisite :

Course Outcomes (CO): Students will be able to

CO1	Understand the Strategic Management Process.
CO2	Apply Strategic Analysis Tools for Competitive Advantage.
CO3	Analyze External Environmental Factors Impacting Firms.
CO4	Design and Implement Business-Level Strategies.

	Course Contents	CO	Hours
Unit 1	**The Tools of Strategic Analysis:** Strategy and the Strategic Management Process, What Is Competitive Advantage, The Strategic Management Process, Measuring Competitive Advantage, Emergent Versus Intended Strategies.	**CO1**	**(04)**
Unit 2	**Evaluating a Firm's External Environment:** Understanding a Firm's General Environment, The Structure-Conduct-Performance Model of Firm, Performance, A Model of Environmental Threats. Industry Structure and Environmental Opportunities.	**CO2**	**(04)**
Unit 3	**Evaluating a Firm's Internal Capabilities :** The Resource-Based View of the Firm, The VRIO Framework, Applying the VRIO Framework, Imitation and Competitive Dynamics in an Industry, Implications of the Resource-Based View.	**CO2**	**(05)**
Unit 4	**Cost Leadership:** Business-Level Strategy, Cost Leadership, The Value of Cost Leadership, Cost Leadership and Sustained Competitive Advantage , Organizing to Implement Cost Leadership.	**CO3**	**(04)**
Unit 5	**Product Differentiation:** Product Differentiation, The Value of Product Differentiation, product differentiation and Sustained Competitive Advantage, Organizing to Implement Product Differentiation.	**CO3**	**(05)**
Unit 6	**Vertical integration & Corporate diversification:** Corporate Strategy, Vertical Integration, Vertical Integration and Sustained Competitive Advantage, Organizing to Implement Vertical Integration, Corporate Diversification, Organizational Structure and Implementing Corporate, Diversification, (**Self Study**: Management Controls and Implementing Corporate).	**CO4**	**(06)**

Text Books

1.	Jay B. Barney and William S. Hesterly, "Strategic Management and Competitive Advantage Concepts", 5th edition, Pearson Education Limited 2015 (Unit : 1,2,3,4,5,6)
2	Mason Carpenter Gerry Sanders, "Strategic Management Concepts and Cases", 2nd Edition Pearson Education Limited 2014

Reference Books

1.	Frank Rothaer, "Strategic Management Concepts", McGraw-Hill Irwin, 2014.
2.	Michael A. Hitt, R. Duane Ireland, Robert E. Hoskisson, "Strategic Management Concepts and Cases", 7th edition, South Western College Pub, 2006
3.	Michael A. Hitt, R. Duane Ireland, Robert E. Hoskisson, "Strategic Management Concepts Competitiveness and Globalization", South Western College Pub, 2010

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc22_mg88/preview Prof. Sanjib Chowdhury, IIT Kharagpur
2.	https://archive.nptel.ac.in/courses/110/108/110108047/ Prof. R. Shrinivasan, IISc, Banglore

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	1	2	-	2	-	3	2	1	1	1	1	1	-
CO 2	-	1	3	1	1	3	3	-	3	2	2	-	1
CO 3	-	-	3	2	2	3	2	-	3	1	2	1	2
CO 4	-	2	2	3	-	2	3	2	2	1	1	-	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	10	-
Understand	-	10	-
Apply	-	10	-
Analyse	-	10	-
Evaluate	-	10	-
Create	-	-	-
TOTAL	-	50	-

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3407 : Professional Ethics				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	-
Tutorials	00 Hrs/week		ISE	25
Total Credits	02		ESE	-

Prerequisite :

Course Outcomes (CO): Students will be able to

CO1	Apply analytical techniques to enhance Self-awareness of personality types.
CO2	Utilize ethical decision-making principles to negative complex dilemmas.
CO3	Implement professional work ethics to achieve excellence in practice.
CO4	Analyse positive interpersonal skills through effective collaboration strategies.

	Course Contents	CO	Hours
Unit 1	**Developing self-knowledge:** Know Yourself, Profiles and Types, personality, Applying Your Knowledge of Personality, Applying Your Knowledge of Learning Styles, Introverts and Extroverts	**CO1**	**(03)**
Unit 2	**Recognize your values and ethics:** Observe yourself, ethics Should and Should Nots, Personal Code of Ethics, The Importance of Being on Time, The Art and Importance of Follow. Personal, financial and private resopocibility.	**CO2**	**(05)**
Unit 3	**Achieving professional excellence:** Establishing a Work Ethic, Unselfish Excellence, Professional Etiquette, Professional Attitude, Professional Privacy, Professional Honesty	**CO3**	**(05)**
Unit 4	**Approach situations with an enthusiastic and genuinely:** Ways to Be Aggressively Nice in the Office, Improve Interpersonal Skills in the Office, Be Aggressively Nice in Business Dealings, Your Role with Your Team. (**Self Study**: The Benefits of Mentoring)	**CO4**	**(04)**
Unit 5	**Improve your time-management, and goal setting, skills:** The Tyranny of the Urgent, Setting Personal Goals, short term goals, long term goals, Schedule the Plan, Avoid Procrastination, Memory Skills	**CO1**	**(05)**
Unit 6	**Maintain balance to succeed in the workplace** Unreasonable Expectations, The Power of Working Hard, Roll with the Punches, Admit Your Mistakes, Sense of Humor.	**CO2**	**(05)**

Text Books

1.	David Strelecky, Ferguson, "Professional Ethics and Etiquette", 2nd Edition, An imprint of Facts On File, Inc (Unit: 1,2,3,4,5,6)
2	R. Subramanian, "Professional Ethics", Oxford University Press, 2015.
3	Caroline Whitbeck, "Ethics in Engineering Practice & Research", 2nd Edition, Cambridge University Press 2015.

Reference Books

1.	Charles E Harris Jr., Michael S Pritchard, Michael J Rabins "Engineering Ethics, Concepts Cases", 4th edition, Cengage learning, 2015.
2.	Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
3.	John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4.	Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
5	Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility", Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6	Erode, "World Community Service Centre Value Education", Vethathiri publications, 2011

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc22_mg54/preview Prof. Susmita Mukhopadhyay, IIT Kharagpur
2.	https://archive.nptel.ac.in/courses/109/106/109106117/ Prof. Shrikumar Mellickappli, IIT Madras

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Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	1	-	1	1	1	3	3	-	1	1	3	1	-
CO 2	1	-	1	2	2	2	2	-	2	2	2	2	1	-
CO 3	-	2	-	1	1	1	3	3	1	1	3	3	1	-
CO 4	-	-	1	2	2	2	3	1	3	2	2	3	1	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	5	-
Understand	-	5	-
Apply	-	5	-
Analyse	-	5	-
Evaluate	-	5	-
Create	-	-	-
TOTAL	-	25	-

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Government College of Engineering, Karad					
Second Year (Sem – IV) B. Tech. Electrical Engineering					
EE3408 : AC Machines Lab					
Laboratory Scheme:			**Examination Scheme:**		
Practical	02 Hrs/week		ISE	50	
Total Credits	01		ESE	25	
Prerequisite : Machines Fundamental					
Course Outcomes (CO): Students will be able to					
CO1	Make appropriate connections for testing of AC machines				
CO2	Deduce conclusions about the performance using obtained readings				
CO3	Calculate regulation and efficiency of single and three phase machines				
CO4	To select appropriate AC machines for the application				

Course Contents		CO
Implementation of following concepts		
Experiment 1	Determination of efficiency & speed regulation of 3 phase induction motor by direct loading method	**CO1**
Experiment 2	Determination of circle diagram parameters of 3 Phase induction motor by conducting No Load &Blocked Rotor Tests.	**CO2**
Experiment 3	Study of starters for 3 Phase induction motors.	**CO4**
Experiment 4	Speed control methods of 3 Ph.IM. (Stator Side).	**CO4**
Experiment 5	Speed control methods of 3 Ph.IM. (Rotor Side).	**CO4**
Experiment 6	Determination of efficiency & speed regulation of 1-phIM.	**CO3**
Experiment 7	Determination of Voltage regulation of an alternator by EMF method.	**CO3**
Experiment 8	Determination of Voltage regulation of an alternator by MMF method	**CO3**
Experiment 9	Determination of Voltage regulation of an alternator by ZPF method.	**CO3**
Experiment 10	Determination of Xd and Xqof an Alternator by Slip test	**CO2**
Experiment 11	Determination of efficiency of synchronous motor by direct loading method	**CO3**
Experiment 12	Determination of efficiency and regulation of Alternator by direct loading method	**CO3**
List of Submission:		
	Minimum number of Experiments : 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	-	-	1	-	1	-	-	-	-	-	-	-
CO 2	1	2	-	1	-	1	-	-	-	-	-	1	-
CO 3	-	1	3	2	1	1	-	-	-	-	-	2	-
CO 4	-	1	2	3	-	1	-	-	-	-	-	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

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Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical engineering				
EE3409: Analog & Digital Electronics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01		ESE	25

Prerequisite : Basic Electronics engineering, AC & DC circuits, Numbering system, Logic Gates and flip flops, Diode and BJT

Course Outcomes (CO): Students will be able to

CO1	Design logical, sequential, and combinational digital circuit using K-Map.
CO2	Demonstrate different digital memories and programmable logic families.
CO3	Apply and analyze applications of OPAMP in open and closed loop condition.
CO4	Design uncontrolled rectifier with given specifications

Course Contents		**CO**
Perform any eight (three experiment should be on bread board/trainer kit) experiment from following list:		
Experiment 1	Design of logical circuit for display of decimal number on seven segment display. **(Hardware)**	**CO1**
Experiment 2	Deign 3:8 decoder for binary to octal decoding.**(Hardware)**	**CO2**
Experiment 3	Design three bit full adder using any open source software. **(Software)**	**CO2**
Experiment 4	Design logical circuit to convert binary to EXCESS 3/Gray number system. **(Hardware)**	**CO3**
Experiment 5	Design digital clock or stop watch using decade counter.(IC74192)**(Hardware)**	**CO3**
Experiment 6	Find phase angle difference between same frequency signal using ZCD and AND gate. **(Hardware)**	**CO3**
Experiment 7	Design of comparator and schmitt trigger. **(Hardware)**	**CO3**
Experiment 8	Study of Instrumentation amplifier using three Op-amp, CMRR measurement **(Hardware)**	**CO3**
Experiment 9	A. Design sine, and triangular wave generator. **(Hardware)** B. Design astable multivibrator using IC-555. **(Hardware)**	**CO4**
Experiment 10	Design first order high pass and low pass filter using OPAMP in any open source software. (For this provide one statement to each of four students to perform with desired cut-off frequency. Each group will demonstrate their result and prepare documentation) **(Software)**	**CO4**
Experiment 11	Design of monostable mutivibrator using IC555 and digital circuit to count number of pulses. **(Hardware)**	**CO4**
Experiment 12	Design of single phase bridge rectifier with output voltage and specified ripple.(this practical should be design by each students, perform in simulation and demonstrate with hardware in laboratory with design documents) **(Software and Hardware)**	**CO4**
List of Submission:		
	Minimum number of Experiments : 10	

Mapping of COs and POs

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PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	1	-	1	-	-	-	-	-	-	-	-
CO 2	1	2	-	1	-	1	-	-	-	-	-	-	1	-
CO 3	-	1	3	2	1	1	-	-	-	-	-	-	2	-
CO 4	-	1	2	3	-	1	-	-	-	-	-	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25	25	25

DEPARTMENT OF ELECTRICAL ENGINEERING Board Of Studies Year GCE KARAD

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Electrical Engineering Department

Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3410: Power Electronics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	25

Prerequisite : MATLAB fundamentals

Course Outcomes (CO): Students will be able to

CO1	Plot VI characteristics of various power electronics switches.
CO2	Simulate converter circuits. and analyze its performance
CO3	Demonstrate inverter circuit using MATLAB.
CO4	Analyze the voltage waveform for PWM inverter using various modulation techniques.

Course Contents		CO
Implementation of following concepts		
Experiment 1	Study & verification of SCR characteristics.	**CO1**
Experiment 2	Study & verification of MOSFET and IGBT characteristics.	**CO1**
Experiment 3	MATLAB simulation and verification of performance parameters of 1-ph diode rectifiers	**CO2**
Experiment 4	MATLAB simulation and verification of performance parameters of 3-ph diode rectifiers.	**CO2**
Experiment 5	MATLAB simulation of 1-ph controlled rectifier.	**CO2**
Experiment 6	MATLAB simulation and performance parameters verification of 3-ph controlled rectifiers.	**CO2**
Experiment 7	MATLAB simulation and verification of performance parameters of non-isolated DC-DC converters.	**CO2**
Experiment 8	MATLAB simulation and verification of performance parameters of isolated DC-DC converters.	**CO2**
Experiment 9	MATLAB simulation of inverter.	**CO3**
Experiment 10	MATLAB simulation for various PWM techniques.	**CO4**
List of Submission:		
	Minimum number of Experiments: 08	

Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO2
CO 1	3	-	-	1	-	1	-	-	-	-	1	-	-
CO 2	-	2	3	3	3	1	-	-	-	-	1	3	1
CO 3	-	2	3	3	3	1	-	-	-	-	1	3	1
CO 4	3	2	2	3	3	1	-	-	-	-	2	3	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Avg
Task I	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3411: Environmental Science				
Teaching Scheme			**Examination Scheme**	
Lectures	02 Hrs/week		MSE	--
Tutorials	00 Hrs/week		ISE	--
Total Credits	Audit Course		ESE	--

Prerequisite : Universal Human Values

Course Outcomes (CO): Students will be able to

CO1	Understand environmental principals which in turn help in sustainable development.
CO2	Develop technologies on the basis of ecological principles.
CO3	Evaluate environmental impacts of human activities on ecosystems and on the environment.
CO4	Apply interdisciplinary knowledge in environmental science.

	Course Contents	CO	Hours
Unit 1	**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains and ecological pyramids. Flow of energy, ecosystem value, services, Field visits.	**CO1**	**(03)**
Unit 2	**Natural Resources:** Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs. (**Self Study:** renewable and non-renewable energy sources, use of alternate energy source, case studies)	**CO3**	**(05)**
Unit 3	**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.	**CO4 CO2**	**(05)**
Unit 4	**Environmental Pollution and Control Technologies:** Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. (**Self Study**:- Pollution case studies:- Bhopal Gas Tragedy, Chernobyl nuclear accident)	**CO4 CO2**	**(05)**
Unit 5	**Global Environmental Issues and Global Efforts**: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.	**CO1**	**(03)**
Unit 6	**Environmental Policy, Legislation & EIA:** Introduction to Environmental Protection act, Air Act1981, Water Act, Forest Act, Wild life Act, biomedical waste management and handling rules, hazardous waste management and handling rules. Nature of Environmental Policies, Stockholm Conference (1972), Rio Conference (UNCED, 1992) EIA: EIA structure, methods of baseline data acquisition.. Towards Sustainable Future: Concept of Sustainable Development. Environmental Ethics, Concept of Green Building, Ecological Foot Print.	**CO4 CO3**	**(05)**

General Instruction:
Course coordinator will decide the suitable assessment method for internal evaluation of 50 marks and award Pass or Fail grade for the course completion.

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Text Books	
1.	Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", University Grants Commission. (Unit: 1,2,3,4,5)
2.	R. Rajagopalan, "Environmental Studies", Oxford University Press. (Unit: 1,2,3,4)
3.	Dr. M. Anji Reddy, "Text book of Environmental Science and Technology", 2007, BS Publications. (Unit: 1,2,3,4,5,6)
4.	Dr. P. D. Raut, "Text book of Environmental studies", Department of Environmental Science, Shivaji University, Kolhapur. (Unit: 1,2,3,4,5,6)
Reference Books	
1.	Richard T. Wright, "Environmental Science: towards a sustainable future", PHL Learning Private Ltd. New Delhi, 2008
2.	Gilbert M. Masters and Wendell P. Ela, "Environmental Engineering and science", PHI Learning Pvt. Ltd., 2008
3.	Daniel B. Botkin & Edward A. Keller, " Environmental Science", Wiley INDIA edition.
Useful Links	
1.	https://www.unishivaji.ac.in/uploads/syllabus/2022/syllabus/common/Environmentat%20English%20Book%201-3-2022%20Final%20Corrected%20copy_compressed.pdf

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	-	-	-	-	-	3	2	-	-	-	-	-	1
CO 2	-	-	3	-	-	3	2	3	-	-	-	-	1
CO 3	-	-	-	-	-	-	3	-	-	-	-	-	1
CO 4	-	-	-	-	-	3	2	3	-	-	3	-	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

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Government College of Engineering, Karad				
Second Year (Sem – IV) B. Tech. Electrical Engineering				
EE3412: Community Engagement Project				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		ISE	50
Total Credits	01		ESE	--

Prerequisite : Students must be willing to learn and understand

- The role of community engagement in national development.
- The responsibility of Indian citizens towards community development.

Course Outcomes (CO): Students will be able to

CO1	Undertake community problem identification, formulation and solution.
CO2	Design engineering solutions to complex problems.
CO3	Implement a project that focuses on community issues.
CO4	Communicate with the community and demonstrate the knowledge.

Course Contents

Implementation of following concepts

The course outlines the benefits of community engagement through research and innovation. Students will be able to understand the various problems of any community and the possible ways to address the same. The specific objectives of the course could depend on the problem definition for the project but the overall Performance must be measured on the following criteria.

1. Literature survey and Problem statement- Students should be able to define the problem statement with Clearly specified inputs and outputs. A brief survey of the available literature and an initial draft of possible directions should be adequate.

2. Modelling or Theoretical results- An appropriate model should be chosen for the problem. They should be

Able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance.

3. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use.

4. Demonstration and Presentation- A model designed and implemented should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work.

Maximum two students may carry out the project together.
Project should be based on community problem.
Evaluation will be done based on presentations, written report and developed system.

Text Book	Principles of Community Engagement, 2nd Edition, NIH Publication No. 11-7782, Printed June 2011.
Link	https://onlinecourses.swayam2.ac.in/ugc23_ge04/preview

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