Shroff S.R. Rotary Institute of Chemical Technology

Ref: UPL University /SRICT/BOS/EE/2022-23/03

Teaching Scheme for
Third Year Bachelor of Electrical Engineering

Semester-V (Electrical Engineering) Structure

Sr. No.	Category	Course Code	Course Name	Hours Per Week			Total Hours	Credits	E	M	I	V	Total
				L	T	P							
1	Humanities & Social Science	EE2312	Economics for Engineers	3	0	0	3	3	70	30	0	0	100
2	Program core courses	EE2313	Signals and Systems	3	0	2	5	4	70	30	20	30	150
3	Program core courses	EE2314	Electrical Power System-II	3	0	2	5	4	70	30	20	30	150
4	Program core courses	EE2315	Power Electronics-I	3	0	2	5	4	70	30	20	30	150
5	Professional Elective - II	EE2316/ EE2317	Professional Elective - II	2	0	2	4	3	70	30	20	30	150
6	Open Elective-I	EE2318/ EE2319	Open Elective-I	3	0	0	3	3	70	30	0	0	100
7	Audit Course-III	MH2301	CPDP-I	1	1	0	2	2	50	30	20	0	100
8	In Plant Training	MH2303	In Plant Training	0	0	0	0	1	0	0	50	0	50
	Total						27	24	470	210	150	120	950

Semester-VI (Electrical Engineering) Structure

Sr. No.	Category	Course Code	Course Name	Hours Per Week			Total Hours	Credits	E	M	I	V	Total
				L	T	P							
1	Program core courses	EE2320	Electrical Switchgear	3	0	0	3	3	70	30	0	0	100
2	Program core courses	EE2321	Power Electronics-II	3	0	2	5	4	70	30	20	30	150
3	Professional Elective - III	EE2322/ EE2323	Professional Elective - III	3	0	2	5	4	70	30	20	30	150
4	Professional Elective -IV	EE2324/ EE2325	Professional Elective -IV	3	0	0	3	3	70	30	0	0	100
5	Open Elective-II	EE2326/ EE2327	Open Elective-II	4	0	0	5	4	70	30	0	0	100
6	Open Elective-III	EE2328/ EE2329	Open Elective-III	3	0	2	5	4	70	30	20	30	150
7	Audit Course-IV	MH2302	CPDP-II	1	1	0	2	2	50	30	20	0	100
			Total				**28**	**24**	**470**	**210**	**80**	**90**	**850**

Professional Elective-II	
Course Code	**Course Name**
EE2316	High Voltage Engineering
EE2317	Element of Electrical Design

Open Elective-I	
Course Code	**Course Name**
EE2318	Disaster Management
EE2319	Cyber Laws and Ethics

Professional Elective-III	
Course Code	**Course Name**
EE2322	Microprocessor & Microcontroller
EE2323	Power Quality

Professional Elective-IV	
Course Code	**Course Name**
EE2324	Power System Operation and Control
EE2325	Industrial Electrical Systems

Open Elective-II	
Course Code	**Course Name**
EE2326	Industrial Automation
EE2327	Automobile Engineering

Open Elective-III	
Course Code	**Course Name**
EE2328	Embedded System
EE2329	Python Programming

Bachelor of Engineering
Course Code: EE2312
Course Name: Economic for Engineers

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Humanities and Social Sci.

Prerequisite: NA

Rationale: Engineering economics is a field that addresses the dynamic environment of economic calculations and principles through the prism of engineering. It is a fundamental skill that all successful engineering firms employ in order to retain competitive advantage and market share. The subject endeavors to provide them with the tools to optimize profits, minimize costs, analyze various scenarios, forecast fluctuations in business cycles, and more.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA(I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Economic Decisions Making :** Overview, Problems, Role, Decision making process	4
2	**Engineering Costs & Estimation:** Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits. Case Study - Price and Income Elasticity of Demand in the real world	8
3	**Present Worth Analysis**: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.	6
	SECTION-B	
4	**Cash Flow, Interest and Equivalence:** Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.	5

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Course Code: EE2312
Course Name: Economic for Engineers

5	**Cash Flow & Rate Of Return Analysis :** Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.	**8**
6	**Inflation And Price Change:** Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis.	**5**

Text Books:

1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley

Reference Books:

1. Sullivan and Wicks: Engineering Economy, Pearson
2. R.Paneer Seelvan: Engineering Economics, PHI

List of Practical: (Min. 10 Practical should be performed): NA

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe the principles of economics that govern the operation of any organization under diverse market conditions.
CO-2	Explain different types of costs, interests used in engineering projects.
CO-3	Analyze the present worth analysis.
CO-4	Evaluate Interest rates and Understanding cash flow diagram.
CO-5	Analyze cash flow and rate of return.
CO-6	Examine the Inflation and Price Change.

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Bachelor of Engineering
Course Code: EE2312
Course Name: Economic for Engineers

List of Open Source Software/learning website:

1. Websites Recommended: www.finmin.nic.in , www.rbi.org.in , www.planningcommission.nic.in
2. Economic Review, American Economic Review, Economic and Political Weekly (EPW), Economic Times, Business Standard etc

References used for designing a course:

1. GTU
2. Jawaharlal Nehru Technological University Hyderabad

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Bachelor of Engineering
Course Code: EE2312
Course Name: Economic for Engineers

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Bachelor of Engineering
Course Code: EE2313
Course Name: Signals and Systems

Rotary
Ankleshwar

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Professional Core

Prerequisite: Basis of Electrical Engineering

Rationale: Automation in industries and domestic level has made engineers to understand about various systems and signals. The interfacing of the machines with the different controllers specifically needs to calculate and estimate the basics about the signals and systems. Every domain expects engineers to be fundamentally clear about the signals and systems. This subject clears mainly the classification of the signals and systems with their various time and frequency domain analysis for future applications.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Signals and Systems**: Signals and systems everyday life, biomedical, instrumentation domestic and industries. Representations of Signals, Classifications of Signals – Continuous time, Discrete time, comparison among Analog, Digital and Discrete Signals, Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, and the complex exponential. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	08
2	**Mathematical operations on Signals and Systems:** Addition, subtraction, multiplication and division of the signals, parallel and series combinations of the systems, cascading of the systems,impulse response characterization and convolution integral for CT- LTI system, signal responses to CT-LTI system, properties of convolution, LTI system response properties from impulse response, Examples. Impulse response characterization and convolution sum, Causal signal response to DT-LTI systems. Properties of convolution summation, Impulse response of DT-LTI system. DT-LTI system properties from Impulse response.	07

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Bachelor of Engineering
Course Code: EE2313
Course Name: Signals and Systems

		System analysis from difference equation model, examples.	
3	**Z-Transform:** The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.		03
	SECTION-B		
4	**Fourier, Laplace Transform:** Representation of periodic functions, Fourier series, Frequency spectrum of aperiodic signals, Fourier Transform, Relation between Laplace Transform and Fourier Transform and its properties. Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior.		08
5	**Sampling & reconstruction:** The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.		06
6	**Applications based on IoT:** Introduction of the Internet of Things, Types of sensors, Types of actuators, Introduction of Arduino Interfacing of the sensors and actuators with Arduino. Programming in Arduino. Signals storage and its analysis using Arduino.		04

Text Books:

1. Signals and Systems by Alan V. Oppenheim, Alan S. Wilsky and Nawab, Prentice Hall

2. Signals and Systems by K. Gopalan, Cengage Learning (India Edition)

3. Signals and Systems by Michal J. Roberts and Govind Sharma, Tata Mc-Graw Hill Publications

4. Signals and Systems by Simon Haykin and Bary Van Veen, Wiley- India Publications

5. Linear Systems and Signals by B.P.Lathi, Oxford University Press

6. Signal, Systems and Transforms by Charles L. Philips, J. M. Parr and E. A. Riskin, Pearson Education

Reference Books:

1. Signal and Systems by Anand Kumar, 3rd Edition, PHI

2. Internet of Things: Technologies, Applications, Challenges and Solutions by B. K. Tripathy & J. Anuradha, CRC Press, 2017.

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Bachelor of Engineering
Course Code: EE2313
Course Name: Signals and Systems

List of Practical: (Min. 10 Practical should be performed):

1. Generation of some basic signals
2. Logical operations
3. Even and odd parts of signal and sequence & real and imaginary parts
4. Convolution between signals& sequences
5. Verification of linearity of a discrete system.
6. Fourier series Analysis of a LTI system
7. Waveform synthesis using Laplace Transform.
8. Locating the zeros and poles and plotting the pole zero maps in s-plane and z-plane for the given transfer function.
9. Trigonometric Fourier series
10. Z-Transform

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe the type of system and signal in Industries and Domestic level for Interfacing.
CO-2	Derive mathematical model of the systems and signals for the applications.
CO-3	Analyze the response of system for the efficient usage of the systems.
CO-4	Derive mathematical model of the systems and Laplace & Fourier applications.
CO-5	Understanding Sampling Theorem and its application.
CO-6	Design of the system from the available input signals and expected output signals of the industrial model.

List of Open Source Software/learning website:

1. http://www.scilab.org/
2. http://www.gnu.org/software/octave/
3. http://www.vlab.co.in
4. http://www.arduino.cc

References used for designing a course:

1. GTU Sem 5 Signal & System Syllabus
2. SVNIT Signal & System Syllabus

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Bachelor of Engineering
Course Code: EE2314
Course Name: Electrical Power System-II

Shroff S. R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Professional Core Course

Prerequisite: Basic Electrical Engineering and Electrical Power System-I

Rationale: The course is aimed to provide exposure about the modeling of power systems components and transmission line, its analysis and performance including the fault analysis of power systems, brief introduction to corona and transients in power system.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Transmission Line Modeling and Performance**: Short transmission line, Medium transmission line, Long transmission line – Phasor Diagram, Rigorous solution, Evaluation of ABCD constants, Interpretation of long line equations, Ferranti effect, Tuned power lines, Power through a transmission line, Circle diagrams, Methods of voltage control, Examples.	5
2	**Network model formation**: Introduction, Transient on a transmission line, Short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Formation of Y bus, Examples, ZBUS formulation – by inverting YBUS, current injection technique, ZBUS building algorithm (Type – 1, 2, 3, 4 modifications), Examples.	8
3	**Corona:** Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines.	5
	SECTION-B	
4	**Symmetrical Components**: Symmetrical component transformation, Phase shift in star-delta transformers, Sequence impedances of transmission lines, Sequence - impedances and networks of synchronous machines, Sequence impedances and networks of transformers, Construction of sequence networks of a power system, Examples.	6

Bachelor of Engineering
Course Code: EE2314
Course Name: Electrical Power System-II

5	**Unsymmetrical Fault Analysis:** Introduction, Symmetrical component analysis of unsymmetrical faults, Single line to ground fault, Line to line fault, Double line to ground fault, Open conductor faults.	8
6	**Transients in Power Systems:** Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, Travelling Waves on Transmission Lines, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground.	4

Text Books:

1. Modern Power system Analysis: I. J.Nagrath, D. P. Kothari,McGraw Hill Education.
2. Electrical Power systems: C. L .Wadhwa, New Age International Publishers.
3. Principles of Power System: V. K. Mehta, Rohit Mehta, S. Chand Publications.

Reference Books:

1. Power System Analysis and Design: J. Duncan Glover, Thomas J. Overbye, Mulukutla S. Sarma, Cengage Learning India Pvt. Ltd.
2. Elements of Power Systems Analysis: W. D. Stevenson Jr., McGraw Hill Education.

List of Practical: (Min. 10 Practical should be performed):
1. Performance analysis of short transmission line.
2. Performance analysis of Medium transmission line.
3. Performance analysis of Long transmission line.
4. Short circuit in series R-L circuits.
5. Symmetrical components of unbalanced phasors.
6. Analysis of line to ground(L-G) fault in 3-ϕ transmission line.
7. Analysis of line to line (L-L) fault in 3-ϕ transmission line.
8. Analysis of line double line to ground (L-L-G) fault in 3-ϕ transmission line.
9. Analysis of corona loss in 3-ϕ transmission line.
10. Analysis of a capacitance switching.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Examine the performance of short, medium and long transmission line.
CO-2	Analyze the power system network model formation.
CO-3	Understand the effect of corona.
CO-4	Evaluate Symmetrical component transformation.
CO-5	Analyze the concept of Unsymmetrical fault.
CO-6	Understanding the concept of transients in Power System.

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Bachelor of Engineering
Course Code: EE2314
Course Name: Electrical Power System-II

List of Open Source Software/learning website:
1. https://www.scilab.org/
2. https://www.powerworld.com/download-purchase/demo-software/simulator-demodownload

References used for designing a course:

1. GTU
2. AICTE

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Bachelor of Engineering
Course Code: EE2314
Course Name: Electrical Power System-II

Bachelor of Engineering
Course Code: EE2315
Course Name: Power Electronics-I

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of Course: Professional Core Course

Prerequisite: Basic Electronics and its Concepts

Rationale: The power electronic devices and converters employing power electronics devices are now widely used in domestic applications as well as in industrial applications like Electrical Drives, Power Systems, Renewable Energy based power generation, heating applications etc. The course is aimed to act as a foundation block and to provide exposure about various aspects (construction, characteristics, operation, ratings etc.) of power electronic devices.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Power Semiconductor Devices:** Construction and Characteristics of Power diodes, Power Transistors, Uni-Junction transistors (UJT), Programmable UJT, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs), Static Induction Transistors.	5
2	**Basics of Thyristor Family:** SCR, DIACs, TRIACs, Light Activated SCRs (LASCRs), Reverse Conducting Thyristor (RCT), Asymmetrical SCR (ASCR), Gate turn-off Thyristor (GTOs), Integrated Gate- Commutated Thyristor (IGCTs), MOS controlled Thyristor (MCTs), Power Integrated circuits (PICs), Intelligent Modules, etc.	6
3	**Thyristor Operations and Protection:** Construction, working, two transistor analogy, Static & dynamic characteristics, Gate characteristics, Turn on & turn off methods (Commutation methods), Ratings, Series & Parallel operations. Methods of Thyristor Protections. Gate drive circuits.	7

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Bachelor of Engineering
Course Code: EE2315
Course Name: Power Electronics-I

SECTION-B		
4	**DC-DC buck converter:** Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.	5
5	**DC-DC boost converter:** Power circuit of a boost converter & buck-boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.	4
6	**Phase Controlled (AC to DC) Converters:** Concept of phase control using half-wave single phase ac-dc converter, Single phase and three phase half wave and full wave, 1-phase and 3- phase half controlled and fully controlled converters, Analysis with R & RL load, Performance parameters for converters, Operation in continuous and dis-continuous mode, Reactive power considerations, Operation in conversion and inversion mode, Effect of source inductance, Power factor improvement techniques, Dual Converters, Applications.	9

Text Books:

1. Dr. D. M. Patel, "Power Electronics", Atul Prakashan, 2021
2. J. S. Katre, "Power Electronics", Tech Knowledge Publication, 2020.

Reference Books:

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.
2. P.S. Bimbhra, "Power Electronics", Khanna Publishers, New Delhi, 2012.

List of Practical: (Min. 10 Practical should be performed):

1. To Study Power Semiconductor Devices and Thyristor family symbol and its applications.
2. To plot the Transconductance characteristics and Drain characteristics of MOSFET
3. To plot the Transconductance characteristics and Output characteristics of IGBT
4. To plot the V-I characteristic and measurement of latching and holding current of SCR.
5. To Trigger the SCR operating on AC supply using R triggering method.
6. To Trigger the SCR operating on AC supply using RC triggering method.
7. To Trigger the SCR operating on AC supply using UJT triggering method.
8. To plot the output waveform of Single Phase Full Wave Rectifier circuit for R Load.
9. To plot the output waveform of Single Phase Full Wave Rectifier circuit for RL Load.
10. To study three phase full wave controlled rectifier on different loads.
11. To analyze the operation of Buck Converter.
12. To analyze the operation of Boost Converter.
13. To analyze the operation of Buck-boost Converter.

Bachelor of Engineering
Course Code: EE2315
Course Name: Power Electronics-I

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the differences between signal level and power level devices.
CO-2	**Write** the construction and characteristics of Power semiconductor devices. and fundamental of Thyristor and family.
CO-3	**Summarize** the construction and characteristics of Thyristor and its family.
CO-4	**Illustrate** operation and design of DC to DC Buck converters.
CO-5	**Analyze**, operate and design DC to DC Boost & Buck-Boost converters.
CO-6	**Recognize** the controlled rectifier circuits.

List of Open Source Software/learning website:

1. cw.mit.edu/courses/electrical.../6-334-power-electronics-spring-2007
2. Courses available through NPTEL - website: https://nptel.ac.in

References used for designing a course:

1. AICTE Model Curriculum-Jan 2018
2. GTU

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Bachelor of Engineering
Course Code: EE2316
Course Name: High Voltage Engineering

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Professional Elective-II

Prerequisite: Basic Electrical Engineering

Rationale: Electrical power transmission is trending towards higher and higher voltages. Under such scenario, the conceptual understanding related to insulation, testing the HV devices is must for every electrical engineer. The subject deals with HV test generating devices, measurement devices, over voltages including lightning and non-destructive testing as well.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	E (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Electrostatic fields and field stress control:** Electrical field distribution and breakdown strength of insulating materials - fields in homogeneous, isotropic materials - fields in multi-dielectric, isotropic materials. Numerical analysis of electrical fields in high voltage equipment: numerical methods - Charge simulation method (CSM), Finite Difference Method (FDM), Finite Element Method (FEM)	03
2	**Electrical breakdown in gases:** Gases as insulating media - ionization and decay processes, Townsend first ionization coefficient, photo ionization, ionization by interaction of metastable with atoms, thermal ionization, deionization by recombination, deionization by attachment–negative ion formation, examples - cathode processes – secondary effects, photoelectric emission, electron emission by positive ion and excited atom impact, thermionic emission, field emission, Townsend second ionization coefficient, secondary electron emission by photon impact, examples - transition from non-self-sustained discharges to breakdown, the Townsend mechanism, examples - the streamer or 'kanal' mechanism of spark, examples - the sparking voltage– Paschen's law, penning effect.	05

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(Established under Gujarat Private Universities Act, 2009)

Bachelor of Engineering
Course Code: EE2316
Course Name: High Voltage Engineering

3	**Breakdown in liquid and solid dielectrics:** Liquid as insulators, breakdown in liquids - electronic breakdown, suspended solid particle mechanism, cavity breakdown, examples - static electrification in power transformers, transformer oil filtration, transformer oil test, alternative liquid insulations like vegetable oils, esters and silicon oils - breakdown in solids, intrinsic breakdown, streamer breakdown, electromechanical breakdown, edge breakdown and treeing, thermal breakdown, erosion breakdown, tracking - breakdown of solid dielectrics in practice, partial discharges in solid insulation.	**04**
	SECTION-B	
4	**Generation of high voltages:** Generation of high direct voltages, half and full wave rectifier circuits, voltage multiplier circuits, Van de Graff generators, electrostatic generators, examples - generation of alternating voltages, testing transformers, cascaded transformers, resonant transformers, examples - impulse voltages, Standard lightning and switching surge and associated parameters and their corrections, design and construction of impulse voltage generator circuits, Marx circuit, operation, examples - impulse current generator.	**04**
5	**Measurement of high voltages:** High direct voltage measurement, peak voltage measurements by spark gaps, sphere gaps, reference measuring systems, uniform field gaps, rod gaps, factors affecting sphere gap measurements, examples - electrostatic voltmeters - ammeter in series with high ohmic resistors and high ohmic resistor voltage dividers - generating voltmeters and field sensors - the measurement of peak voltages, the Chubb–Fortescue method, high- voltage capacitors for measuring circuits - voltage dividing systems and impulse voltage measurements. Numericals	**05**
6	**Non-destructive test techniques:** Insulation: Measurement of d.c. resistivity - dielectric loss and capacitance measurements, the Schering bridge, current comparator bridges, Tan Delta measurement, Partial-discharge (PD) measurements - the basic PD test circuit, Dissolved gas analysis - Key gas method .Insulation Coordination.	**03**

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Bachelor of Engineering
Course Code: EE2316
Course Name: High Voltage Engineering

Text Books:

1. Naidu M. S. and Kamaraju V., "High Voltage Engineering", fourth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi,2009
2. Wadhwa C.L., "High Voltage Engineering", third edition, New Age publishers, New Delhi,2010.
3. Kuffel,E.,ZaenglW.S.,KuffelJ.,"HighVoltageEngineering:Fundamentals"ButterworthHeinmann (A division of Reed Educational & Profession Publishing Limited), 2nd Edition, 2000.

Reference Books:

1. A. Haddad, D. Warne, "Advances in High Voltage Engineering", IET Power and Energy, Series 40, 2007
2. . Alston L L, High Voltage Technology, Oxford University Press, 2008

List of Practical: (Min. 10 Practical should be performed):

1. Study of high voltage laboratory
2. To study the horn gap arrestor.
3. To determine breakdown mechanism in oil dielectric
4. To determine the dielectric strength of transformer oil.
5. Determination of breakdown voltage for different types of insulating materials.
6. To study sphere gap for measurement of high d.c.& a.c. and impulse voltages.
7. To study the components, control and operation of 150kv, 225j impulse generator.
8. Study of horn gap type lightning arrester by high voltage ac/dc test set.
9. Testing of pin type insulator by ac/dc high voltage tester.
10. To study 50kv capacitance divider.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Apply numerical methods for engineering problem.
CO-2	Recall breakdown mechanism for dielectric materials in solid, liquid and gaseous state.
CO-3	Classify insulation test techniques.
CO-4	Examine methods for generation of test high voltage and as well for its measurement.
CO-5	Examine methods for non destructive test techniques.
CO-6	Conclude about correctness of design and manufacturing of high voltage insulations after performing tests

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Bachelor of Engineering
Course Code: EE2316
Course Name: High Voltage Engineering

List of Open Source Software/learning website:
1. . Finite Element Method Magnetics FEMM
2. LTSpice for circuitsimulation,
3. KiCAD for CADapplication
4. Vlab.co.in

References used for designing a course:

1. GTU Sem 7 High Voltage Engineering
2. SVNIT High Voltage Engineering

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Bachelor of Engineering
Course Code: EE2317
Course Name: Element of Electrical Design

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Professional Elective-II

Prerequisite: Electrical Machine-I

Rationale: This course is a preliminary course for design of various electrical equipments. The aim is to provide the basic principles useful for the subjects related to design in subsequent semesters. The course also includes basics of estimation and costing of house wirings and commercial wirings.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA(I)	
2	0	2	3	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	GENERAL DESIGN ASPECTS: Basic principles of magnetic circuits – use of B-H curves in magnetic circuit; Calculations of MMF for air gap and teeth; Real and apparent flux density; Field Form; Air gap flux distribution factor (field form factor); Magnetizing current calculation; Leakage Reactance calculation for various types of slots, Iron loss calculation concepts. Insulating Materials & Classifications.	3
2	DESIGN OF STARTERS AND FIELD REGULATORS: Introduction and review of A.C. and D.C. starters; Schematic diagrams of control circuit and power circuit for starters with contactors and timers. Design of starters and Field regulators.	5
3	DESIGN OF SMALL TRANSFORMERS AND CHOKE COILS: Design of Small single-phase transformers; Design of variable air gap single phase and three phase choke coil.	4

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	SECTION-B	
4	DC windings : Simplex & Duplex windings; Lap & Wave windings; Applications; Basic terms related to armature windings; Dummy Coils; Equalizer connections; Split coils.	**4**
5	AC windings: Introduction; No. of phases; Phase spread; Concentric winding, Hemitropic winding; Whole coil winding; Mush winding; Double layer windings; Integral slot lap and wave winding; Fractional slot lap and wave windings; Performance analysis of various windings.	**5**
6	Design consideration of Electrical Installation: Types of load, Electrical Supply Systems, Wiring systems, Load Assessment, Permissible voltage drops & Conductor size calculations, Design of Control panel. Estimation and costing for service connections.	**3**

Text Books:

1. A course in electrical machine Design – A. K. Sawhney.
2. Electrical Machine Design – R. K. Agrawal.
3. Design of Electrical Machine - V. N. Mittle.

Reference Books:

1. Elements of Electrical Design – J G Jamnani.
2. Electrical Design, Estimating and Costing – K. B. Raina.

List of Practical: (Min. 10 Practical should be performed):
1. To Study Fundamental Of Magnetic Circuit.
2. To Study Design Of Magnetic Circuit.
3. To Design Of Small Transformers And Ballast.
4. Design of 1-phase Variable Choke Coil and 3-phase Variable Choke Coil.
5. Design of Starters, Field Regulators & Control Panels.
6. Design Consideration of Electrical Installation.
7. To Draw Sheet on DC Armature Windings (Simplex Lap windings).
8. To Draw Sheet on DC Armature Windings (Simplex Wave windings).
9. To Draw Sheet on AC Armature Windings (Mush winding).
10. To Draw Sheet on AC Armature Windings (Double layer Lap windings).

Bachelor of Engineering
Course Code: EE2317
Course Name: Element of Electrical Design

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Explain the basic principles of electrical machine design with relevant applications.
CO-2	Design of electrical starters and field regulators.
CO-3	Understand the electrical equipment's like small transformers and choke coils.
CO-4	Develop the winding diagrams for DC machines as per specifications
CO-5	Develop the winding diagrams for AC machines as per specifications
CO-6	Design the supply systems for residential and industrial applications.

List of Open Source Software/learning website:
NA

References used for designing a course:

1. GTU
2. AICTE

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Bachelor of Engineering
Course Code: EE2317
Course Name: Element of Electrical Design

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Bachelor of Engineering
Course Code: EE2318
Course Name: Disaster Management

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Open Elective - I

Prerequisite: NA

Rationale: This subject is conceptual applications of principles of management to mitigate various disasters.

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction on Disaster:** Understanding the Concepts Disaster, definitions and key terms in Disaster, Hazard, Risk, Risk Management, Risk Reduction, Risk Assessment, Adaption, Capacity, Capacity Development, Resilience, and Structural & Non - Structural Measures, Vulnerability, Vulnerability Profile of India, and General effects on Disaster, Classification of Disaster, Global Disaster Trends, Emerging Risks of Disasters, and Climate Change and Sustainable Development.	6
2	**Types, Trends, Causes, Consequences and Control of Natural Disaster:** Earthquakes, Landslides, Tsunami, Floods, Cyclones, Lightning, Thunder-storms, Hailstorm, Avalanches, Droughts, Cold and Heat waves.	6
3	**Types, Trends, Causes, Consequences and Control of Man-Made Disaster:** Chemical Disaster, Biological Disaster (epidemics, pest attacks), Nuclear and Radiological Disaster, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), Forest Fire, rural and urban fire, War & Terrorism.	6

Bachelor of Engineering
Course Code: EE2318
Course Name: Disaster Management

		SECTION-B		
	4	**Disaster Management Cycle and Framework:** Disaster Management Cycle, Core elements and Phases of Disaster Management, Paradigm Shift in Disaster Management ,Pre-Disaster, Risk Assessment & Analysis, Prevention, Mitigation, Preparedness, Response and Recovery of Disaster Awareness During Disaster, Evacuation, Search and Rescue, Emergency Operation Centre, Relief and Rehabilitation, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo, Framework of Action	**7**	
	5	**Disaster Management in India** Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, Role of Government (local, state and national),Non-Government and Inter-Governmental Agencies	**7**	
	6	**Applications of Science and Technology for Disaster Management & Mitigation:** Geo-informatics in Disaster Management, Disaster Communication System Structural and Non Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India	**4**	

Bachelor of Engineering
Course Code: EE2318
Course Name: Disaster Management

Text Books:

1. Dr. Mrinalini Pandey, Disaster Management, Wiley India Pvt. Ltd.

2. Dr. R P Rethaliya: Disaster Management, Atul Prakashan

3. Jagbir Singh, Disaster Management: Future Challenges and Opportunities, K W Publishers Pvt. Ltd**.**

Reference Books:
1. Singh Satendra (2003): Disaster Management in the Hills, Concept Publishing Company, New Delhi.
2. Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing Corporation, New Delhi.
3. Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila
4. K. Palanivel, Disaster Management, ALLIED PUBLISHERS PVT. LTD.
5. Disaster Management Act 2005, Publisher by Govt. of India
6. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
7. National Disaster Management Policy, 2009, Govt. of India

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To Understand basic concepts and Definitions Terminologies on Disaster.
CO-2	To Discuss Types, Trends, Causes, Consequences and Control of Natural Disaster
CO-3	To Discuss Types, Trends, Causes, Consequences and Control of Man-Made Disaster
CO-4	To Explain Disaster Management Cycle and Framework
CO-5	To memorize Disaster Management and its Act 2005 in India
CO-6	To enhance awareness on Applications of Science and Technology for Disaster Management & Mitigation

List of Open Source Software/learning website:
1. https://nptel.ac.in/
2. https://www.ndrf.gov.in/
3. https://ndma.gov.in/
4. https://iuin-drr.nidm.gov.in/

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Bachelor of Engineering
Course Code: EE2318
Course Name: Disaster Management

References used for designing a course:

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Bachelor of Engineering
Course Code: EE2319
Course Name: Cyber Laws and Ethics

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of Course: Open Elective-I

Prerequisite: Nil

Rationale: This course is focused on technical, legal, and social issues related to cybercrimes, Laws Cyber Ethics. Today cyber crimes are increased in many sectors like in national defense, banking, government etc. Certain codes and securities are required against these types of crimes. Cybercrime and laws is a broad term that includes offences where a computer may be the target, crimes where a computer may be a tool used in the commission of an existing offence, and crimes where a computer may play a subsidiary role such as offering evidence for the commission of an offence. It is also required to have knowledge of Cyber Ethics and its role and significance.

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	PA (I)	ESE (V)	
3	0	0	3	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Cyber World:** The subject covers the basic overview fundamentals and laws related to Cyber World including Cyber Security, Cyber Law, Cyber Networks, etc.	04
2	**Introduction to Cyber law:** Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, CyberspaceWeb space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	08

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3	**Information Technology Act:** Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.	**06**
	SECTION-B	
4	**Cyber law and Related Legislation:** Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).	**08**
5	**Electronic Business and legal issues:** Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	**04**
6	**Cyber Ethics:** The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.	**06**

Text Books:

1. "Cyber Laws: Intellectual property & E Commerce, Security" by Kumar K, dominant Publisher
2. "Cyber Ethics 4.0", by Christoph Stuckelberger, Pavan Duggal, by Globethic

Reference Books:

1. "Information Security policy & Implementation Issues" by NIIT, PHI
2. "Computers, Internet and New Technology Laws", by Karnika Seth, Lexis Nexis Butterworths Wadhwa Nagpur.
3. "Cyber Crimes and Law Enforcement", by Vasu Deva, Commonwealth Publishers, New Delhi, (2003).

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the basics of cyber world.
CO-2	Introduction to Cyber laws.
CO-3	Describe Information Technology act
CO-4	Describe the cyber related legislation.
CO-5	Demonstrate Electronic business and legal issues.
CO-6	Interpret Cyber Ethics.

Bachelor of Engineering
Course Code: EE2319
Course Name: Cyber Laws and Ethics

List of Open Source Software/learning website:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview (Cyber Security web course)
2. www.vlab.co.in

References used for designing a course:

1. https://ili.ac.in/e-learnCL.htm
2. https://cse.nitk.ac.in/course/cyber-law-and-ethics

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Bachelor of Engineering
Course Code: MH2301
Course Name: Contributor Personality Development Program - 1

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Audit Course-III

Prerequisite: Zeal to learn the subject

Rationale: The Contributor Program aims to accomplish the following outcomes in thelives of students–

- Improve the employability of students by giving them the right work ethic andthinking that employers are looking for.
- Build their confidence with which they can go into any job and contributemeaningfully.
- Improve their ability to engage better in the workplace and to be able to handle thechallenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributorswith ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up moreopportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate andmake a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in thelocal communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a) to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.

Bachelor of Engineering
Course Code: MH2301
Course Name: Contributor Personality Development Program - 1

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	1	0	2	70	30	0	50	150

Note:

- Weekly 2 hours of Classroom facilitated sessions are planned which includeSolutioning and Self- discovery sessions.

- In addition, there will be individual/ team projects as part of Practical's. Studentscan do this on their own, with faculty as guide.

Note:

It is the responsibility of the institute heads that marks for PA of theory & ESE and PA of practical for each student are entered online into the UPL University Portal at the end of each semester within the dates specified by UPL University.

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**The Contributor Work Ideal** In this topic, students explore what is their "ideal" of work- is the ideal to be a "worker" or to be a "contributor"? For example, an employee who has the ideal of a "worker" goes to work to pass time, earn a living, get benefits; in contrast to an employee with the ideal of a "contributor" who wants to make a difference, get things done well, create value for the company. This enables students to transform their expectation of themselves in work.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
2	**Identity & Self-esteem** In this topic, students engage with the question "who am I?" or on what basis they define themselves. Is their identitydefined by what others think of them (extrinsic self-esteem) or	4 hrs Classroom engagement (including self-discovery/ solutioning

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		sessions)

	by what they think of themselves (intrinsic self-esteem)? Further, they discover positive identities that lead to intrinsic self-esteem, such as an I-can identity based on one's capacityand inner strength. This enables them to build confidence and self-esteem.	
3	**Become a Creator of one's destiny** In a "victim stance", we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs wherewe remain mediocre. In this topic, students discover the "creator of destiny stance" to challenges and situations. This stance frees them to try out new things, open up new possibilities, take on responsibility, see the opportunity hidden in their environment.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
	SECTION-B	
4	**Achieving Sustainable Success** In this topic, students discover how to achieve sustainable or lasting success, by building one's "engine of success", making them success-worthy. Where their focus shifts to building one's "engine of success"rather than being on chasing the "fruits of success". This is important, because over a lifetime of work, all people go through ups and downs – where the fruits are not in theircontrol. People who are focused on the fruits of success, fall prey to disappointment, loss in motivation, quitting too early, trying to find shortcuts – when fruits don't come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. And with a strong engine of success, fruits come to them in time.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)

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5	**Career Development Models** In this topic, students explore a range of diverse "career development models" and the possibilities for contributioneach opens up to them (e.g. start-up career model, change-maker career model, etc.). This opens their mind to different and even unconventional career models possible, beyond the usual (such as "stable large company career model" where one gets an engineering degree, then MBA, then get a job in a large company). This frees them from a herd mentality when making career choices.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
6	Expanding contribution in every role In this topic, students explore the many roles they can play in their life & discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual's hands. This opens their mind to an alternative way of career growth.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
-	15	15	-	20	20

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E:Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine

2. Web-based ActivGuide^{TM} for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda,Bharatiya Vidya Bhavan, 1989
3. Eternal Values for a Changing Society – Vol I-IV, SwamiRanganathananda; Bharatiya Vidya Bhavan

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4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck;Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer;Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R.Covey, Rebecca
    R. Merrill, Stephen R. Covey; Free Press, 2008
14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act)responsibly, Howard Gardner; John Wiley & Sons, 200

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Students will be able to recognize & appreciate two alternative ideals of work – Ideal of a "worker" and ideal of a "contributor". And why organizations of today expect people they employ to be contributors and not just workers.
CO-2	Students will be able to recognize & appreciate alternative ways in which they could define themselves or "who am I" (their identity) – and which are positive identities that will lead to building intrinsic self-esteem and confidence in oneself; In contrast to identities that will lead to extrinsic self-esteem that makes them more dependent on their environment.
CO-3	Students will be able to recognize & appreciate a "victim" stance as distinct froma "creator of destiny" stance in the way people approach challenges and situations; and how the latter frees individuals to take on challenges and open up Opportunities.
CO-4	Students will be able to differentiate between two alternative approaches to success - 'building one's engine of success' and 'chasing the fruits of success'; they also appreciate the payoffs/ consequences of both and which is more likely to Lead to sustainable or lasting success in the long run.

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CO-5	Students will be able to recognize & appreciate different career models and their Value; to help them make more informed career-related choices.	
CO-6	Students will be able to recognize & appreciate how one can expand the contribution possible in any role, thereby opening up an alternative way of career Growth to them.	

Outcome of practical sessions	
CO-7	Students learn to re-interpret their life and college experiences to showcase their Contribution affinities which are relevant for employers.
CO-8	Students learn to apply contributor thinking to real-world or career relevant Challenges.

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Bachelor of Engineering
Course Code: EE2320
Course Name: Electrical Switchgear

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Program Core Course

Prerequisite: Fundamentals of Power System

Rationale: This course is focused on power system switchgears which are used in the operations. Construction, working and applications of switchgears like fuse, relays, circuit breakers and isolators are covered in this course. Students can able to operate any kind of equipment in the field after completion of this course.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE (E)**	**PA (M)**	**ESE (V)**	**PA (I)**	
3	0	0	3	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Switchgear:** Meaning of Switchgear, Essential features of Switchgear, List different Switchgear equipment used for switching and interruption of current. Differences between Indoor and Outdoor type Switchgear.	04
2	**Fuses:** Desirable Characteristics of Fuse elements, Types of Fuses, Fuse Element Materials Important Terms: Current Rating of Fuse element, Fusing current, Fusing factor, Prospective current, cut off current , Pre Arcing Time, Arcing Time, Breaking Capacity, Total Operating Time. HRC fuses –construction, types, working, Merits, Demerits and applications	06
3	**Protective Relays:** Relay definition, required qualities of Protective Relaying, Necessity for Protection, Primary and Back up protection, Classification of protective Relaying, Important Terms: Pickup current, current setting, PSM, TSM, Time -PSM Curve Construction and working of Induction type Non-directional over current relay Introduction of Static relay, merits and Limitations, Static Type Over Current Relay, Comparison of Static Relays with Electro-Magnetic Relays	08

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Course Name: Electrical Switchgear

	SECTION-B	
4	**Basics of Circuit Breakers:** Circuit breakers-Concept, Classification, working principle, Construction, Merits, Demerits, Arc formation process, methods of arc extinction, working of Circuit Breaker by Trip Circuit Mechanism, Circuit Breaker rating. Explain the terminologies – Arc-Voltage, arching Time, Pre –Arching Time, Prospective Current, TRV, Recovery Voltage, RRRV, and Total Break Time.	**06**
5	**Different Types of Circuit Breakers:** Oil Circuit Breakers-Plain Break Oil Circuit Breakers; Arc Control Circuit Breakers; Low Oil Circuit breakers; Maintenance of Oil Circuit Breakers, Air-Blast Circuit Breakers-Types of Air-Blast Circuit Breakers, Air-Break Circuit Breakers- Types of Air-Break Circuit Breakers, Sulphur Hexafluoride Circuit Breakers, Vacuum Types of Circuit Breaker	**06**
6	**Over-voltage Switch Gears:** Causes of over-voltages, Internal causes of over-voltages, Mechanism of lightning discharge, Types of lightning strokes, Harmful effects of lightning, Protection against lightning, Earthing screen, Overhead ground wires, Lightning arresters, Surge absorber, Capacitance switching, Over-voltages due to arcing ground.	**06**

Text Books:

1. "Principles of Power System" by V. K. Mehta, Rohit Mehta S. Chand, 4th revised edition 2008
2. "Power System Protection And Switchgear" by Buvanesh A Oza, Nirmalkumar C Nair, Rases P Mehta and Vijay H Makwana, McGraw HILL Education(India Pvt. Ltd) New delhi

Reference Books:

1. "Switchgear & Protection", by J. B. Gupta (edition), Katson Publisher,2008
2. "Testing , commissioning , operation and maintenance of electrical equipment" by Sunil S Rao, Khanna Publications

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Knowledge of the basic terms and definitions of switchgears.
CO-2	Introduction of the concept of fuses and its components.
CO-3	Understand the concept of Relays and its components.
CO-4	Demonstrate and acquire the knowledge about circuit breakers performance parameters.
CO-5	Operate the of different types of circuit breakers.
CO-6	Perform the operations of different types of overvoltage switchgears.

List of Open Source Software/learning website:

1. https://onlinecourses.nptel.ac.in/noc21_ee110/preview/ (Switchgear web course)

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Bachelor of Engineering
Course Code: EE2320
Course Name: Electrical Switchgear

References used for designing a course:

1. https://nptel.ac.in/courses/108107167
2. https://nptel.ac.in/courses/108101039

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Bachelor of Engineering
Course Code: EE2321
Course Name: Power Electronics-II

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Professional Core Course

Prerequisite: Power Electronics - I

Rationale: The power electronic devices and converters employing power electronics devices are now widely used in domestic applications as well as in industrial applications like Electrical Drives, Power Systems, Renewable Energy based power generation, heating applications etc. The course is designed to provide exposure of power electronic converters and their operation and control to obtain variable AC voltage (magnitude and/or frequency).

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA(I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Single-phase Voltage Source Inverter:** Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.	6
2	**Three-phase Voltage Source Inverter:** Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation. Three phase bridge inverter – $180°$ and $120°$ conduction mode.	5
3	**PWM Techniques in Inverter:** Principle of PWM control, PWM techniques classifications, Unipolar and Bipolar PWM, Effect of Switching frequency on Harmonic Spectrum, Sinusoidal PWM, Third harmonic PWM, Selective Harmonic Elimination, Hysteresis band current control PWM, Space vector pulse width modulation technique, Comparison of PWM techniques.	7

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	SECTION-B	
4	**AC Voltage Controller:** Triac characteristic and operating modes, Triac as Single-phase AC voltage controller, Principle of Phase Control, On-off Control, Mathematical analysis related to single-phase AC voltage controller, Three-phase AC voltage controller configurations: Operations, Waveforms, Analysis	**6**
5	**Cycloconverter:** Introduction; Basic Principle; Single to single-phase Cycloconverter; Three-phase half-wave Cycloconverter; Cycloconverter for three phase output; Output voltage equation; Output harmonics in Cycloconverter; Comparison between Cycloconverter and DC link Converter; Load Commutated Cycloconverter.	**6**
6	**Miscellaneous:** Frequency Control: Introduction to matrix converter; basic power circuit and their operating principle. Datasheet interpretation. Ratings of the devices and Selection of switches. Overvoltage, overcurrent and short-circuit protection; Electromagnetic interference and its remedies.	**6**

Text Books:

1. Dr. D. M. Patel, "Power Electronics", Atul Prakashan, 2021
2. J. S. Katre, "Power Electronics", Tech Knowledge Publication, 2020.

Reference Books:

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.
2. P.S. Bimbhra, "Power Electronics", Khanna Publishers, New Delhi, 2012.

List of Practical: (Min. 10 Practical should be performed):

1. To plot the output Characteristics of 1-Phase Square-wave half-bridge inverter with R load.
2. To plot the output Characteristics of 1-Phase Square-wave half-bridge inverter with R-L load.
3. To learn different PWM Techniques (Single PWM, Multiple PWM & SPWM) Basic Concepts of Modulation.
4. To plot the output Characteristics of Single Phase SPWM Full -bridge inverter with R load.
5. To plot the output Characteristics of Single Phase SPWM Full -bridge inverter with R-L load.
6. To determine the Phase Voltages and Line Voltages for three phase inverter with Y connected R Load by varying frequency in 180^0 operating mode.
7. To determine the Phase Voltages and Line Voltages for three phase inverter with Y connected R Load by varying frequency in 120^0 operating mode.
8. To determine the Phase Voltage and Line Voltage for 3-phase SPWM inverter with Y-connected R Load.
9. To plot the load voltage waveform for Single Phase Half controlled AC Voltage Controller.
10. To plot the load voltage waveform for Single Phase Full controlled AC Voltage Controller.

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Bachelor of Engineering
Course Code: EE2321
Course Name: Power Electronics-II

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Illustrate** operation and design of dc-to-ac single phase inverters.
CO-2	**Analyze,** operate and design dc-to-ac three phase inverters.
CO-3	**Recognize** the need of PWM techniques in inverter operation.
CO-4	**Write** the operation and design of AC Voltage Regulators.
CO-5	**Analyze**, operate and design of Cycloconverter.
CO-6	**Summarize** and interpret the datasheet of power devices.

List of Open Source Software/learning website:

1. cw.mit.edu/courses/electrical.../6-334-power-electronics-spring-2007
2. Courses available through NPTEL - website: https://nptel.ac.in

References used for designing a course:

1. AICTE Model Curriculum-Jan 2018
2. GTU

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Bachelor of Engineering
Course Code: EE2322
Course Name: Microprocessor and Microcontroller

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Professional Elective-III

Prerequisite: Analog & Digital Electronics

Rationale: Microcontroller is used in almost all the domestic, Industrial & Consumer products and other high end products. Automation is used in every field engineering and microcontroller is inbuilt element if these systems and devices. Electrical Engineers have to deal with various microcontroller based systems and maintain them. This course is intended to develop the skills to maintain and solve the application problems related to microcontroller.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE(V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Basics of 8085 Microprocessor and 8051 microcontroller:** Comparison of 8085 Microprocessor and 8051 microcontroller, Architectural Block Diagram, Schematic and Pin diagrams, Pin functions, Bus Organization, 8085 machine cycles, Fetch and execution of only MOV, MVI, and OUT instructions with timing diagram. Harvard and Van-numen architecture Pin Diagram of 8051, Stack and memory organization.	6
2	**Instruction Sets and Assembly programing of 8051:** Types of Addressing modes, Instruction sets (Data transfer, logical, arithmetic, branching), Embedded C and Assembly C language programing,	6
3	**8051 Timer & Counter & Interrupts :** Timer/Counter (SFR, TMOD, TCON), Sample programs of timer/counter to generate time delay, SFR-Interrupts (IP & IE)	6
	SECTION-B	
4	**8051 Serial & Parellal Communications & PORT structure:** Serial communications (SBUF, SCON, PCON, Modes), Sample programs on serial communications. I/O port structure and configure P0, P1, P2 & P3.	5

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Course Code: EE2322
Course Name: Microprocessor and Microcontroller

5	**8051 I/O device Interfacing and applications:** I/O interfacing with LED, 7-Segment display, LCD, DAC & ADC. Square wave generation, PWM pulse generation.	7
6	**Introduction of Advanced Microcontrollers:** STM32F10C8T6 controller(ARM cortex-M3, ATmega328, PIC16F877A controller, DSP 320F28335 Controller.+	6

Text Books:

1. The 8051 Microcontroller And Embedded Systems: Using Assembly And C by Muhammad Ali Mazidi, Rolin McKinlay, Janice Gillispie Mazidi, Pearson Education, New Delhi, 2nd Edition (2007 or latest)
2. Microcontrollers theory and applications by Ajay V Deshmukh, TMH, New Delhi
3. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing by Subrata Ghoshal, Dorling Kindersley, New Delhi, 1st Edition (2010 or latest)

Reference Books:

1. Microcontroller & Embedded Systems, Authors: Mazidi, M. A/ Mazidi, J. G. Publication: Pearson Education.

List of suggested Practical: (Min. 10 Practical should be performed):

1. Find Largest/smallest from a series using Assembly Language Programming 8051 Trainer kit.
2. Sum of a series of 8 bit data using Assembly Language Programming 8051 Trainer kit.
3. Square / cube / square root of 8 bit data using Assembly Language Programming 8051 Trainer kit.
4. Sorting (Ascending/Descending) of data using Assembly Language Programming 8051 Trainer kit.
5. Time delay generation by Interfacing using 8051 Trainer kit and interfacing modules.
6. Display (LED/Seven segments/LCD) and keyboard interface using 8051 Trainer kit and interfacing modules.
7. DC motor interface using 8051 Trainer kit and interfacing modules.
8. Distance measurement using 8051 Trainer kit and interfacing modules.
9. Alphanumeric LCD display interface using 8051 Trainer kit and interfacing modules.
10. Write a C program to send letters to LCD using delays.
11. Write a C program to generate Square wave using DAC interface to 8051.
12. Write a C program to generate PWM Pulse using DAC interface to 8051.
13. Write a C program to rotate stepper motor in clockwise/anticlockwise direction.
14. Write ALP to interface ADC-0804 and convert an analog input connected to it.
15. Interface a simple toggle switch to 8051 and write an ALP to generate an interrupt which switches on an LED (i) continuously as long as switch is on and (ii) only once for a small time when the switch is turned on.

Bachelor of Engineering
Course Code: EE2322
Course Name: Microprocessor and Microcontroller

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Describe** the operations of microprocessor architecture 8051.
CO-2	**Understand** the concepts of microcontroller 8051 and advanced microcontrollers.
CO-3	**Experimenting** the different type of programing techniques of 8051.
CO-4	**Integrating** the I/O of 8051 with external devices.
CO-5	**Validating** the concepts to developing real time applications using 8051.
CO-6	**Design** 8051 microcontroller based circuits.

List of Open Source Software/learning website:

1. keil (demo freeware)
2. http://www.8051projects.net/microcontroller-tutorials/
3. http://www.intorobotics.com/8051-microcontroller-programming-tutorials-simulatorscompilers-and-programmers/

References used for designing a course:

- GTU curriculum

- SRM University Curriculum

Bachelor of Engineering
Course Code: EE2323
Course Name: Power Quality

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Program Elective-III

Prerequisite: Fundamentals of Power Systems and Power Electronics

Rationale: Quality of power can have direct impact on many industrial consumers. There has recently been a great emphasis on revitalizing industry with more automation and more modern equipment. This usually means electronically controlled, energy-efficient equipment that is often much more sensitive to deviations in the supply voltage. This worsens the quality of power. The electric utility is concerned about power quality issues as well. This course would make the students aware about the various issues affecting the power quality as well as techniques available to improve the quality of power.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Power Quality:** Definition of power Quality, power quality terminology, power quality issues, Susceptibility Criteria, Responsibility of supplier and users of elect power, Standards, Power Frequency Disturbance: Common power frequency disturbances, voltage sags, cures of low frequency disturbances, voltage tolerance, Electrical Transients: Transient system model, Examples of models & response, Types and causes of transients, Examples of transient wave forms.	**06**
2	**Harmonics:** Definition , number, odd and even harmonics, causes of harmonics, Individual & total distortion, Harmonics signatures, Effect of harmonics, Guide lines for harmonic voltage & current limitation, Harmonic current mitigation.	**06**
3	**Power Factor:** Introduction, Active and Reactive power, Displacement and true power factor, power factor improvement, correction, penalty, voltage rise due to capacitance, application of synchronous condensers and static VAR compensators, Application of Standards—B.C. Hydro's Approach, Examples of the Harmonic Studies.	**06**

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Course Code: EE2323
Course Name: Power Quality

SECTION-B			
4	**Electromagnetic Interference:** Electric and magnetic fields, Electromagnetic interference terminology, Power frequency fields, High frequency interference, EMI Mitigation, Cable shielding to minimize EMI, Health concerns of EMI	08
5	**Power Quality Measurement:** Power quality measurement devices, power quality measurements, Number of test locations, Test duration, Instrument setup, Instrument set up guidelines.	06
6	**Distributed Generation and Power Quality:** Resurgence of DG, DG technologies, Interface to the utility system, Power quality issues, Operating conflicts,	04

Text Books:

1. Power Quality by C.Sankaran, CRC publication

Reference Books:

1. Electrical Power Systems Quality by Roger C.Dugan , TMH publication

2. Harmonics and Power Systems by Francisco C. De La Rosa, CRC Publication

List of Practical: (Min. 10 Practical should be performed):

1) Study and calculation of THD and IHD of various types of non-linear loads
2) Power factor improvement using static VAR compensators
3) Measurement of current harmonics using current probe
4) Measurement of high frequency noise with oscilloscopes having high sampling rates
5) Measurement of true RMS value of voltage and current using true RMS meters
6) Measurement of magnetic and electric field using low frequency electromagnetic field meter
7) Study of harmonic distortion limits in agreement with IEEE 519
8) Study of power quality monitoring standards such as IEEE 1159 and IEC 61000-4-30
9) MATLAB for simulation of harmonics generated by non-linear loads.
10) Power & harmonic Analyzer.

Bachelor of Engineering
Course Code: EE2323
Course Name: Power Quality

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Explain Various Power Quality terms of Electrical Power System.
CO-2	Analyze the causes of Harmonics, its effect on various equipment and its mitigation techniques.
CO-3	Analyze the application of Static Var Compensators for reactive power compensation in power systems.
CO-4	Analyze the power factor in power systems.
CO-5	Evaluate performance of power systems (in regards to Power Quality Issues) under various power quality polluting devices using appropriate power quality monitoring tools.
CO-6	Application of Power quality measurement devices.

List of Open Source Software/learning website:

1. https://nptel.ac.in/courses/108106025

References used for designing a course:

1. GTU Sem 8 Power Quality & Management
2. SVNIT Power Quality Issues.

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Bachelor of Engineering
Course Code: EE2324
Course Name: Power System Operation and Control

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Program Elective-IV

Prerequisite: Fundamentals of Power System Analysis

Rationale: This course is focused on power system control learning. Basic controlling (-Automatic generation and control, reactive power control of transmission line, voltage control, state estimation and load forecasting topics) of power systems are covered in this course.

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	PA (I)	ESE (V)	
3	0	0	3	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Automatic Generation Control and Voltage Control:** Introduction; Load Frequency Control (Single Area Case); Load Frequency Control and Economic Dispatch Control; Two-Area Load Frequency Control; Automatic Voltage Control; Load Frequency Control with Generation Rate Constraints (GRCs)	05
2	**Reactive Power and Voltage Control:** Introduction; Reactive power requirement of an uncompensated line; Implication of surge impedance loading; Reactive loss characteristics of transmission line; Operation of a transmission line at no load condition; Operation of a transmission line under heavy loading condition; Voltage regulation of the transmission line and its relation with reactive power; Maximum power transfer in an uncompensated line; Line load ability. Reactive power-voltage (Q-V) coupling concept; Operational aspects in reactive power and voltage control; Basic principle of system voltage control; Reactive power flow constraints and their implications in loss of voltage; Power System Voltage Stability : Introduction, Difference between angle stability and voltage stability, Causes of voltage instability, types, proximity and mechanism of voltage stability, Practical aspects of reactive power flow problems leading to voltage collapse in EHV lines.	08

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Bachelor of Engineering
Course Code: EE2324
Course Name: Power System Operation and Control

3	**Power System Security:** Introduction; System State Classification; Security Analysis; Contingency Analysis; Sensitivity Factors: generation shift distribution factor, line shift distribution factor	**05**
	SECTION-B	
4	**State Estimation:** Introduction; Least Squares Estimation: The Basic Solution; Static State Estimation of Power Systems; Tracking State Estimation of Power Systems; Some Computational Considerations; External System Equivalency; Treatment of Bad Data; Network Observability; Application of Power System State Estimation	**06**
5	**Load Forecasting:** Introduction; Forecasting Methodology; Estimation of Average and Trend Terms; Estimation of Periodic Components; Estimation of ys(k): Time Series Approach; Estimation of Stochastic Component: Kalman Filtering Approach; Long-Term Load Predictions Using Econometric Models; Reactive Load Forecasting.	**06**
6	**Introduction to Power System Deregulation and Restructuring:** Introduction; Motivation for Restructuring of power system; Electricity market entities and model; Benefits of Deregulation; Basic terminologies; Deregulation – International scenario; Milestones of deregulation in the world; **Indian power sector – Past and present status:** Growth of power sector in India – An overview, A time line of the Indian power sector, Players in the Indian power sector, Research, and professional bodies.	**06**

Text Books:

1. "Modern Power System Analysis", by D. P. Kothari, I. J. Nagrath, TMH Publication
2. "Power System Analysis", by J. J. Grainger, W.D. Stevenson, Mc-Graw Hill series publication

Reference Books:

1. "Power Generation Operation and Control" by A. J. Wood, B. F. Woolenberg, John Wiley and Sons
2. "Power System Analysis", by Hadi Saadat, Mc-Graw Hill series publication

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Apply concepts of frequency control and voltage control in small sample single area power system.
CO-2	Analyse performance of transmission lines with respect to reactive power requirement for voltage stability.
CO-3	Learn the power system security and its application as a system operator.
CO-4	Estimate the state of small sample power system.
CO-5	Describe concepts of power system load forecasting.
CO-6	Explore the significance of power system restructuring.

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Course Code: EE2324
Course Name: Power System Operation and Control

List of Open Source Software/learning website:

1. http://nptel.ac.in/courses/108101040/ (PSOC webcourse)
2. www.vlab.co.in

References used for designing a course:

1. http://nptel.ac.in/courses/108101040/
2. http://nptel.iitm.ac.in/courses.php

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(Established under Gujarat Private Universities Act, 2009)
Bachelor of EngineeringCourse
Code: EE2325
Course Name: Industrial Electrical System

Rotary
Ankleshwar

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Professional Elective-IV

Prerequisite: Knowledge of Basic Electrical Engineering, Basic Electronics, Digital Electronics, Electrical Measurement and Instruments

Rationale: Electricity is the major power source for almost all small scale to large scale industries. Per capita consumption of electricity is an indicator of the growth of a country. In view of this, it is important for the electrical engineers to understand the components of residential, commercial and industrial electrical systems. This subject deals with the introduction to components of industrial electrical systems. The subject also includes selection of ratings for various components based on applications and basics of automation of industrial electrical systems.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE (E)**	**PA (M)**	**ESE(V)**	**PA (I)**	
3	0	0	3	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Essential Industrial Electrical System Components :** Industrial Wires &Cables, Fuses, Switches, Protection components-ELCB,MCB,RCCB,RCCB, Transformers, Circuit Breaker, Isolators, Relays, Electric Panel - PCC, MCC, PDB, Starters, Electric drives, Lighting Arrestor, PF Correction Panel	6
2	**Industrial Power Distribution System:** Understating of Single line diagram of Industrial power distribution system, Symbol of SLD, Type of Industrial Power distribution system, Industrial substation and its, types, basic of earthing, lightning Protection systems.	6
3	**Industrial Illumination Systems:** Understanding various terms regarding light, types of illumination schemes, losses in lighting system, measurement of lighting system, Technologies in Industrial Illumination system	6

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Bachelor of EngineeringCourse
Code: EE2325
Course Name: Industrial Electrical System

		SECTION-B		
	4	**Sizing & Selection of Industrial Electrical Equipment's** Calculation Electric of Electric Load, Sizing of Transformer, Cable, Electric Motor , PCC and MCC Panel, LT Circuit breaker, Earthing system, DG System, Power factor correction Panel, UPS and Battery bank System	8	
	5	**General Electric Safety Requirements in Industrial Electric System:** Key points General Electric Safety Requirements as per CEA regulations, LOTO System, Personal protective equipment's (PPE)	4	
	6	**Industrial Electrical System Automation:** Importance of Automation in Industry, Role of Industrial Automation in Electrical system, Basic of PLC and its Application, Importance of SCADA, application of Industry 4.0 technologies in Industrial Electrical System	6	

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Bachelor of EngineeringCourse
Code: EE2325
Course Name: Industrial Electrical System

Text Books:

Reference Books:
1. E. Open Shaw Taylor, "Utilization of Electric Energy", Orient Longman,1st Edition,1937
2. J.B. Gupta, "Utilization of Electric Power and Electric Traction", Kataria & Sons publishers,Delhi, IX Edtion, 2004.
3. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New Age International (P) Limited Publishers, 3rd Edition, 2010
4. S. L.Uppal and G.C.Garg," Electrical wiring Estimating & costing" Khanna publishers,2008
5. Utilization of electric Energy by E. Openshaw Taylor, Orient Longman Private Limited,1971
6. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997
7. CEA Regulations 2010.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To Know the basic function of Industrial Electrical System Components
CO-2	To learn Industrial Power Distribution system and Illumination system
CO-3	To explain Illumination and illumination system
CO-4	To analyses Sizing & Selection of Industrial Electrical Equipment's
CO-5	To explain importance of General Electric Safety Requirements in Industrial Electric System
CO-6	To enhance awareness on Industrial Electrical System Automation

List of Open Source Software/learning website:
- **http://nptel.ac.in**

References used for designing a course:

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(Established under Gujarat Private Universities Act, 2009)
Bachelor of EngineeringCourse
Code: EE2326
Course Name: Industrial Automation

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Open Elective - II

Prerequisite: Knowledge of Basic Electrical Engineering, Basic Electronics, Digital Electronics, Electrical Measurement and Instruments

Rationale: Automation is playing a key role in Industries. Industries rely heavily on automation for economic viability and mass production. It is important for the students to learn basic of automation; This course will provide opportunity to learn industrial automation techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	**T**	**P**	**C**	**ESE (E)**	**PA (M)**	**ESE (V)**	**PA (I)**	
4	0	0	4	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Industrial Automation:** Fundamental of Automation & Automation system, Advantages and Disadvantages of Automation System, Industrial Automation, Need of Industrial Automation, Benefits of Industrial Automation, Architecture of Industrial Automation system, Types of Industrial Automation System, Industrial Automation tools, Industrial bus systems.	10
2	**Automation Components:** Sensors, Actuators, process control valves, review of power electronics devices DIAC, TRIAC, power MOSFET and IGBT. Review of DC and AC servo drives	6
3	**Programmable logic controllers (PLC):** Programmable logic controllers, Architecture of PLC, Components of PLC, Languages of PLC, PLC Selection, Advantage & Disadvantages of using PLC for Industrial automation, Application of PLC in Industries.	8

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Bachelor of EngineeringCourse
Code: EE2326
Course Name: Industrial Automation

	SECTION-B	
4	**Distributed Control System:** Importance of DCS , Structure of DCS, Basic Components of a Typical DCS Network, Working & Operation of DCS System, Comparison between PLC and DCS Advantages of DCS, Application of DCS in Industry.	8
5	**Industrial automation using robots:** Basic construction and configuration of robot, Types of Industrial Robots, Cartesian Robot, SCARA Robot, Articulated Robot, Parallel Robots, Pick and place robot, Welding robot, Selection of Industrial Robot and Application of Industrial Robots	8
6	**Internet of things (IoT) and Industry 4.0** Fundamentals of Internet of things(IoT), Basic working of IoT, Benefit of IoT in Industrial Automation System, History of Industry Revolution, Overview of Industry 4.0 Technologies including Big Data and AI analytics, Horizontal and vertical integration, Cloud computing, Augmented reality (AR), Additive manufacturing/3D printing, Cyber Security and Benefits of Industry 4.0 Model to Industry.	8

Text Books:

Reference Books:

1. Dr. R. Anjana, Industrial Automation, Technical Publications
2. Industrial Instrumentation and Control By. S.K. Singh The McGraw Hill Companies
3. Programmable logic controller, Dunning, Delmar
4. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover, P.H.I.Learning Private Limited
5. Hydraulics and Pneumatics by Andrew Parr, JAICO Publishing Home, Ahmedabad
6. Industrial Automation and Robotics by Er. A. K. Gupta and S. K. Arora, University Science Press Laxmi Publishing Pvt. Ltd.
7. Robotics and Control by R. K. Mittal and I. J. Nagrath, McGraw Hill Education (India) Private Limited.
8. Anagha H. Sahasrabudhe, Industry 4.0, Technical Publications
9. I. A. Dhotre, Industrial Internet Of Things, Technical Publications

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To Understand basic concepts Industrial Automation System
CO-2	To Identify different Components and its application for industrial automation
CO-3	To Demonstrate PLC for Industrial Automation
CO-4	To Learn Distributed Control System
CO-5	To explain importance of Industrial automation robots
CO-6	To enhance awareness on Internet of things (IoT) and Industry 4.0

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Bachelor of EngineeringCourse
Code: EE2326

Course Name: Industrial Automation

List of Open Source Software/learning website:

- Open Source Software:
    - LTSpice for circuit simulation,
    - KiCAD for CAD application
- Web-based tools for design:
    - http://www.fairchildsemi.com/support/design-tools/power-supply-webdesigner/
    - http://www.ti.com/lsds/ti/analog/webench/overview.page
- Circuit Lab:
    - https://www.circuitlab.com/editor/
- Open source Math Tools:
    - http://maxima.sourceforge.net/
    - http://www.sagemath.org/
    - http://www.scilab.org/
    - http://www.gnu.org/software/octave/
- Learning website
    - http://www.electrical-engineering-portal.com/
    - http://nptel.iitm.ac.in/courses.php
- Virtual Lab Website
- www.vlab.co.in

References used for designing a course:

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Bachelor of EngineeringCourse
Code: EE2326
Course Name: Industrial Automation

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Bachelor of Engineering
Course Code: EE2327
Course Name: Automobile Engineering

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Open Elective-II

Prerequisite: Basics of Mechanical Engineering, Physics, Environmental Sciences, Kinematics and Theory of Machines and Dynamics of Machinery

Rationale: The aim is to introduce students to the vehicle structure and associated systems. Fundamentals related to vehicle and its systems' layouts, basic design of vehicle body structure and selection of systems components are introduced.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction:** Automobile classification and specification, Automobile chassis: General layout, types of layout and its arrangement, Body construction type and materials, Functional requirements of vehicle body, Body trim and fittings.	6
2	**Road Load Analysis:** Vehicle Loads: Forces acting on vehicle in motion, Transmission efficiency, Factors affecting it. Rolling resistance, Grade resistance, tractive force with uniform speed and with acceleration of vehicle, Traction characteristic. Dynamic factor, weight transfer due to various resistance acting on a vehicle in motion. Stability of a vehicle in motion around the curve.	8
3	**Power Transmission systems:** Clutch: Constructional features and working of single plate, multi plate, semi centrifugal and centrifugal clutch, Calculation of surface area and number of driving and driven plates. Transmission gear box: sliding mesh, constant mesh, synchromesh gearboxes and four wheel drive. Propeller shaft and Final drive: Propeller shaft, universal joints, Hotchkiss & Torque tube Drives, front drive shaft types and its construction and working, Differential gear box, rear axle. Automatic Transmission and CVT Fault and diagnosis of power transmission system.	10

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Bachelor of Engineering
Course Code: EE2327
Course Name: Automobile Engineering

SECTION-B		
4	**Wheel and Tyres:** Types of wheels, types of tyres, tyre construction, constituents of tyre, tyre tread pattern, tyre pressure and wear, tyre properties, tyre size, tyre maintenance.	**6**
5	**Electrical, Electronics and Safety systems:** Engine control Unit, Monitoring and Instrumentation, Safety interlocks and alarms, Lamps, Lighting and other circuits, fuel gauge, temperature gauge, wiper, speedometer and odometer. Active and Passive Safety systems, Seat belt, Air bag, ACD, Electronic Stability Control (ESC), Tire Pressure Monitoring System (TPMS), Lane Departure Warning System (LDWS), Adaptive Cruise Control (ACC), Driver Monitoring System (DMS), Blind Spot Detection (BSD) and Night Vision System (NVS).	**12**
6	**Modern Automobiles:** Layout and components of Electric and Hybrid Vehicle, Types of Hybrid vehicles, Batteries, Electric Motors, Regenerative Braking.	**6**

Text Books:

1. Automobile Engineering Vol- I & II by Dr. Kirpal Singh, Standard Pub.& Dist
2. Automobile Engineering by R.B.Gupta , Satya Prakashan

Reference Books:

1. Automobile Technology by Dr. N.K.Giri, Khanna Pub.
2. Automotive Mechanics by W.Crouse , Tata Mc Graw Hill.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Compare** and select type of vehicle as per safety, features and applications.
CO-2	**Evaluate** vehicle performance for different driving and road conditions.
CO-3	**Demonstrate** working of various Automobile Systems
CO-4	**Study** of wheel and tyre, identity faults and diagnosis of automobile systems.
CO-5	**Summaries** modern hybrid Automobiles.

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Course Name: Automobile Engineering

List of Open Source Software/learning website:

1. Courses available through NPTEL - website: https://nptel.ac.in

References used for designing a course:

1. AICTE Model Curriculum-Jan 2018
2. GTU

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Bachelor of Engineering
Course Code: EE2328
Course Name: Embedded System

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Open Elective- III

Prerequisite: Knowledge of Fourier transforms Probability theory

Rationale: This course will provide students with more techniques in the image processing for image enhancement and restoration of noisy images. Emphasis is given more on implementation of various algorithms so that students will able to develop their own algorithm. The techniques covered in the syllabus have wide applicability in any field which needs to handle the image data.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	Introduction to Embedded Systems Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices In a System, Embedded Software in a system, Examples of Embedded Systems, Embedded System-on-chip (SOC) and Use of VLSI Circuit Design Technology, Complex Systems Design and Processors, Design Process in Embedded System, Formulization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills Required for an Embedded System Designer	6
2	Device and Communication Buses Timer and Counting Devices: Watch dog timer, Real time clock, Brown Out Reset, Serial Communication protocols : UART, I2C, SPI, SDIO, CAN, SDIO, USB, JTAG, Spy-Bi-Wire Parallel Communication protocols : ISA, AMBA, PCI, PCI-X, Wireless Communication Protocols : IrDA, Bluetooth, WiFi, Zigbee	6
3	Device Drivers and Interrupt Services Mechanism Programmed-I/O Busy-wait Approach without Interrupt Services Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing(Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processor Interrupt Service Mechanism from Context-Saving Angle, Direct Memory, Access, Device Driver Programming.	6

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Course Name: Embedded System

		SECTION-B		
	4	Inter-process Communication: Multiple process in an application, Multiple Threads in an application, Task and Task state, Task and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions.	6	
	5	Software architectures and Real Time Task Scheduling: Requirements of Embedded Software, Interrupts- Basics, latency, Process state and scheduling, Clock driven and Event driven scheduling, Rate, Monotonic Scheduling, Earliest-Deadline First Scheduling, Fault-Tolerant Scheduling, Round Robin, Round robin with interrupt, function queue scheduling.	6	
	6	MSP430 (Case Study): Motivation for MSP 430 Microcontrollers, MSP430 RISC CPU architecture, Compiler-friendly features, On-chip peripherals and programming for - Watchdog Timer, Basic Timer, Real Time Clock (RTC), ADC, Universal Serial Communication Interface (USCI), Low-power features of MSP430.	8	

Text Books:

1. Embedded System: Architecture, Programming and Design by Raj Kamal, 2nd Edition, TMH Publication

Reference Books:

[1] Embedded Software Premier David Simon (Pearson)
[2] Computers as Components Principles of Embedded Computing System Design by Wayne Wolf, Morgan Kaufman
[3] Real Times Systems Theory and Practice by Rajib Mall (Pearson Education)
[4] Embedded Real-time Systems Programming Sri Ram Iyer and Pankaj Gupta (TMH)
[5] The Linux Programming Interface , Michael Kerrisk
[6] MSP430 Microcontroller Basics by John H. Davies, 1st Edition, Elsevier

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO-2	Recognize basics of various embedded hardware and protocol standards.
CO-3	Learn and analyze basics of operating system fundamentals and real-time operating systems concepts
CO-4	Analyze Inter-Process Communication methods.
CO-5	Learn programming using POSIX concept.
CO-6	Design software for embedded computer systems using a real-time operating system.

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Bachelor of Engineering
Course Code: EE2328
Course Name: Embedded System

List of Open Source Software/learning website: NA

References used for designing a course:

1. AICTE
2. GTU
3. PDU

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Bachelor of Engineering
Course Code: EE2329
Course Name: Python Programing

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Open Elective-III

Prerequisite: Basics of C Language

Rationale: Python is general purpose programming language becomes very popular in last decade. In this age, every Electronics, Electrical and Computer engineers must learn Python Programming to build applications in their core domain. Python is becoming popular in artificial intelligence, IoT and machine learning applications.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE(V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction, Data Types and Operators:** Installation and working with Python, Variables and data types in python, Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple and string operations.	8
2	**Python Decision making:** Write conditional statements using If statement, if ...else statement, elif statement and Boolean expressions. Programs using decision making.	4
3	**Python Loops:** While loop, For loop, Nested Loop, Infinite loop, Break statement, Continue statement, Pass statement, Use for and while loops along with useful built-in functions to iterate over and manipulate lists, sets, and dictionaries. Plotting data, and loops. Programs using loops.	6
	SECTION-B	
4	**Python Functions and Modules:** Defining custom functions, Organising Python codes using functions, Create and reference variables using the appropriate scope.	6

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Bachelor of Engineering
Course Code: EE2329
Course Name: Python Programing

5	**Python Modules:** Basic skills for working with lists, tuples, work with dates and times, get started with dictionaries, Importing own module as well as external modules, Programming using functions, modules and external packages.	8
6	**Python File Operations:** An introduction to file I/O, use text files, use CSV files, use binary files, Handle a single exception, handle multiple exceptions, Illustrative Programs, Exercises.	4

Text Books:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Python Programming Fundamentals- A Beginner's Handbook by Nischay kumar Hegde
3. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
4. Introduction to Python for Engineers and Scientists, By. Sandeep Nagar, ApressReference Books:

List of suggested Practical: (Min. 10 Practical should be performed):

1. Write a program to demonstrate different number datatypes in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python script to print the current date in following format "Sun May 29 02:26:23 IST 2017".
5. Write a python program to create, append and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python
8. Write a python program to find largest of three numbers
9. Write a python program to convert temperature to and from Celsius to Fahrenheit.
10. Write a python program to construct the following pattern using nested for loop:
11. Write a python program to print prim numbers less than 20:
12. Write a python program to find factorial of a number using recursion:
13. Write a python program to that accepts length of three sides of a triangle as inputs. The program should indicate whether or not the triangle is a right angled triangle (use Pythagorean theorem):
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
15. Write a python program to define a module and import a specific function in that module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.

Bachelor of Engineering
Course Code: EE2329
Course Name: Python Programing

Course Outcomes:
Students will be able to:

Sr. No.	CO statement
CO-1	**Memorize** the scripting language for python.
CO-2	**Recognized** lists, tuples, functions, loops and decision statements and dictionaries in Python.
CO-3	**Solve** the error in programming in core Python.
CO-4	**Experiment** the loops and decision statements in Python.
CO-5	**Validating** the concepts to developing real time applications using 8051.
CO-6	**Design** and program Python applications.

List of Open Source Software/learning website:
1. https://www.coursera.org/learn/python-programming
2. Python Software
3. NPTEL Video lecture on Python Programming

References used for designing a course:

- GTU curriculum

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Bachelor of Engineering
Course Code: MH2302
Course Name: Contributor Personality Development Program - II

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Audit Course-IV

For Year: Pre-final year for all Diploma, Degree & Masters programs over 2 semesters. For e.g. for Bachelors of Pharmacy and Engineering, the course will be conducted in Semesters V & VI.

Rationale: The Contributor Program aims to accomplish the following outcomes in thelives of students–

- Improve the employability of students by giving them the right work ethic andthinking that employers are looking for.
- Build their confidence with which they can go into any job and contributemeaningfully.
- Improve their ability to engage better in the workplace and to be able to handle thechallenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributorswith ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up moreopportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate andmake a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a)to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.

Bachelor of Engineering
Course Code: MH2302
Course Name: Contributor Personality Development Program - II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	1	0	2	50	30	00	20	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Finding Solutions** The market environment in which organizations are operating, is becoming increasingly dynamic and uncertain. So, employers are increasingly seeking out people who can innovate and figure out solutions in the face of any challenge (unlike in the past when it was the people who were most efficient and productive, who were valued by organizations). At the heart of innovation lies this way of thinking of "finding solutions" rather than "seeing problems or roadblocks". Students learn how to build this way of thinking, in this topic.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
2	**Creating Value** Companies are also looking for employees who do not just work hard, or work efficiently or productively - but those who will make a valuable difference to the fortunes of the company. This difference may come from innovation, but itmay also come from focusing on the right things and identifying what really matters – both to the company andto the customers. In this topic, students learn how to build this capability.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
3	**Engaging deeply** The environment we live in is becoming increasingly complex because more and more things are gettinginterconnected, new fields are emerging, technologies are	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)

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	rapidly changing, capabilities and knowledge one is trained in will become fast obsolete. In such a scenario, the student's ability to quickly understand and master what is going on, dive deep, get involved in any area, rapidly learn new capabilities that a job demands, is important. Engagingdeeply is a core way of thinking that can help them in this. In this topic, students learn how to engage deeply.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
SECTION-B		
4	**Enlightened self-interest & collaboration at work** The changing nature of work in organizations and in the global environment is increasingly demanding that people work more collaboratively towards shared goals and more sustainable goals. A key to working successfully when multiple stakeholders are involved is "thinking in enlightened self-interest". In this topic, students learn howto develop this way of thinking (going beyond "narrow self-interest").	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
5	**Human-centered thinking & Empathy** In this topic, students explore a human-centric approach to work – where the ability to recognize and respond to other people (whether they are users or customers or team members) as a human being with human needs and difficulties, is essential. This is at the heart of user-centric design of products and solutions, at the heart of genuine customer- centricity in services, and of any successful interaction with other people.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
6	**Trust Conduct** The biggest currency in a sustainable career is "trust" i.e. being trusted by team members, bosses, and customers. When we are trusted, people listen to us, they are willing to give us the chance to grow, give us the space to make mistakes, and work seamlessly with each other without always having to "prove ourselves". In this topic, studentslearn how to demonstrate conduct that builds the trust of people.	4 hrs Classroom engagement (including self-discovery/ solutioning sessions)
Showcase Lab Sessions		3 hrs
Project work		Beyond classroom

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
-	20	20	20	20	20

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E:Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine

2. Web-based ActivGuide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda,Bharatiya Vidya Bhavan, 1989
3. Eternal Values for a Changing Society – Vol I-IV, SwamiRanganathananda; Bharatiya Vidya Bhavan
4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck;Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer;Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R.Covey, Rebecca
R. Merrill, Stephen R. Covey; Free Press, 2008

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14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act)responsibly, Howard Gardner; John Wiley & Sons, 200

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Students will be able to recognize & appreciate the thinking required to find solutions in the face of any challenge.
CO-2	Students will be able to recognize & appreciate different types of value that can be created and the different ways to create value for others.
CO-3	Students will be able to recognize & appreciate how to engage deeply, and its need, value, payoffs and consequences in different contexts.
CO-4	Students will be able to differentiate between 'enlightened self-interest' and 'narrow self-interest' & appreciate the payoffs/ consequences of both when working with multiple stakeholders.
CO-5	Students will be able to recognize & appreciate the human side of situations or interactions or projects that will help them develop a more human-centric approach/ response to work.
CO-6	Students will be able to recognize & appreciate conduct which builds trust of people in contrast to conduct which breaks trust of people - in teams / organization & the value of trust conduct in various situations.

Outcome of practical sessions	
CO-7	Students complete their 'Contributor Showcase Profile' on the Showcase Platform. This includes (a) completing Illumines Contributor Mindset Assessment (b) building evidence to demonstrate their functional orientationsas contributors.
CO-8	Students learn to apply contributor thinking to think-through and address real-world challenges.