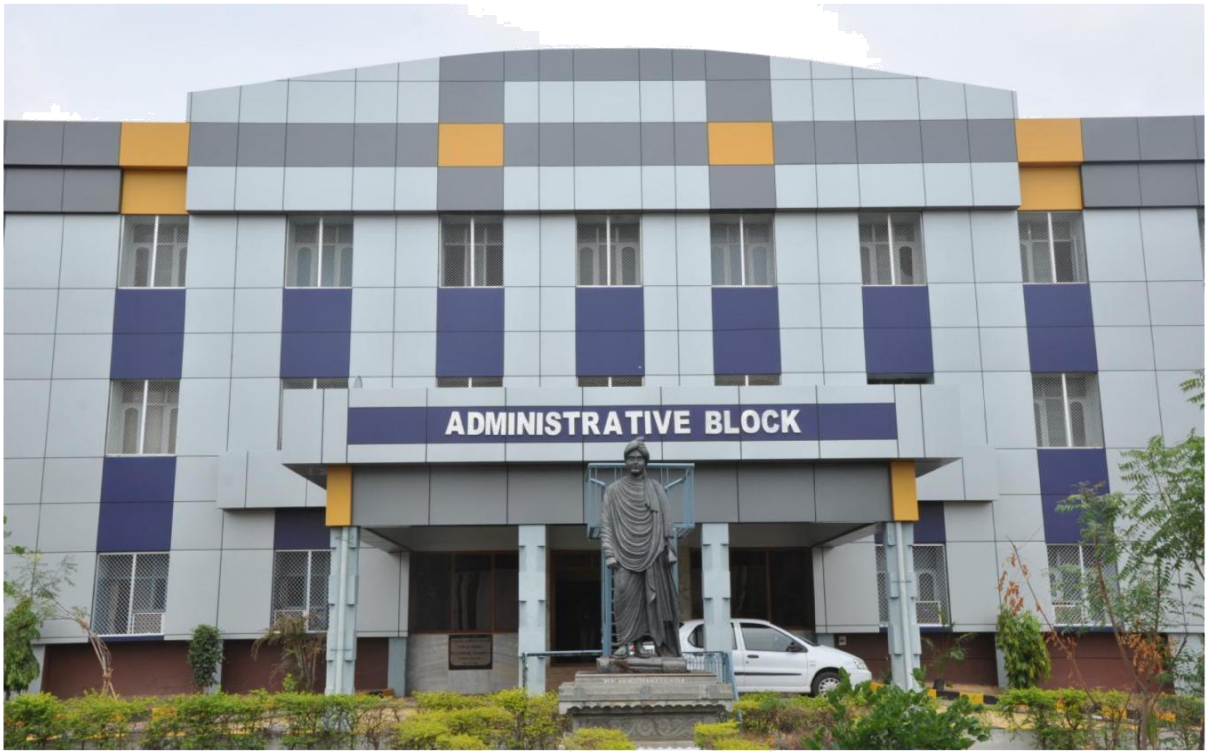

Scheme – 2020

Electrical & Electronics Engineering Department

G. Pulla Reddy Engineering College (Autonomous): Kurnool

Accredited by NBA of AICTE and NAAC of UGC

Affiliated to JNTUA, Anantapuramu

Scheme and Syllabus for

II, III & IV Year of FOUR YEAR B.Tech. Degree Course in

ELECTRICAL & ELECTRONICS ENGINEERING

(With Effect from the Batch Admitted from 2020-21)

ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

FOUR YEAR B.TECH. DEGREE COURSE

Scheme of Instruction and Examination

III SEM EEE **Scheme-2020**

S. No	Category	Course Code	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
					L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
I			**Theory**							
1.	BSC	BS202	Probability and Statistical Analysis	3	3	0	0	60	40	100
2.	PCC	EC213	Analog Circuits	3	3	0	0	60	40	100
3.	PCC	EC201	Digital System Design	3	3	0	0	60	40	100
4.	PCC	EE201	Electrical Machines-I	3	3	0	0	60	40	100
5.	PCC	EE202	Electrical and Electronic Measuring Instruments	3	3	0	0	60	40	100
6.	SC	SCEE01	Introduction to Python Programming	2	1	0	2	60	40	100
7.	MC	MC104	Professional Ethics	0	2	0	0	--	100	100
II			**Practical**							
8.	PCL	EE203	Electrical Circuits Laboratory	1.5	0	0	3	60	40	100
9.	PCL	EE204	Basic Simulation Laboratory	1.5	0	0	3	60	40	100
10.	PCL	EE205	Electrical Measurements Lab	1.5	0	0	3	60	40	100
			Total	**21.5**						**1000**

IV SEM EEE **Scheme-2020**

S. No	Category	Course Code	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
					L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
I			**Theory**							
1.	ESC	EE206	Control Systems Engineering	3	3	0	0	60	40	100
2.	BSC	BS204	Complex Variables & Numerical Methods	3	3	0	0	60	40	100
3.	PCC	EE207	Power Systems – I	3	3	0	0	60	40	100
4.	PCC	EE208	Electrical Machines – II	3	3	0	0	60	40	100
5.	HSS	HU201	Managerial Economics & Principles of Accountancy	3	3	0	0	60	40	100
II			**Practical**							
6.	ESL	EE209	Control Systems Lab	1.5	0	0	3	60	40	100
7.	PCL	EE210	Electrical Machines Laboratory – I	1.5	0	0	3	60	40	100
8.	PCL	EC214	Analog & Digital Systems Laboratory	1.5	0	0	3	60	40	100
9.	SC	SCCM01	Soft Skills Lab	2	0	0	4	60	40	100
			Total	**21.5**						**900**

ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

FOUR YEAR B.TECH. DEGREE COURSE

Scheme of Instruction and Examination

V SEM EEE **Scheme-2020**

S. No	Category	Course Code	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
					L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
I			**Theory**							
1.	PCC	EE301	Power Electronics-I	3	3	0	0	60	40	100
2.	PCC	EE302	Power Systems - II	3	3	0	0	60	40	100
3.	PCC	EC318	Integrated Circuits and Microprocessors	3	3	0	0	60	40	100
4.	PEC		Professional Elective-I	3	3	0	0	60	40	100
5.	OEC		Open Elective-I	3	3	0	0	60	40	100
6.	MC	MC103	Constitution of India	0	2	0	0	-	100	100
II			**Practical**							
7.	PCL	EE306	Electrical Machines-II Laboratory	1.5	0	0	3	60	40	100
8.	PCL	EC319	Integrated Circuits and Microprocessors Laboratory	1.5	0	0	3	60	40	100
9.	SC	SCEE02	Programmable Logic Controllers	2	0	0	4	60	40	100
10.			Summer Internship-I	1.5	-	-	-	-	100	100
			Total	**21.5**	**17**	**0**	**10**	**480**	**520**	**1000**

VI SEM EEE **Scheme-2020**

S. No	Category	Course Code	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
					L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
I			**Theory**							
1.	PCC	EE307	Power Systems - III	3	3	0	0	60	40	100
2.	PCC	EE308	Power Electronics-II	3	3	0	0	60	40	100
3.	PCC	EE309	Microcontrollers	3	3	0	0	60	40	100
4	PCC	EE310	Electromagnetic Fields	3	3	0	0	60	40	100
5.	PEC		Professional Elective-II	3	3	0	0	60	40	100
6.	OEC		Open Elective-II	3	3	0	0	60	40	100
7.	MC	MC104	Essence of Indian Traditional Knowledge	0	2	0	0	-	100	100
II			**Practical**							
8.	PCL	EE314	Power Electronics and Drives Laboratory	1.5	0	0	3	60	40	100
9.	PCL	EE315	Power Systems Laboratory	1.5	0	0	3	60	40	100
10.	PCL	EE316	Microcontrollers Laboratory	1.5	0	0	3	60	40	100
11.	SC	SCEE03	Hybrid Power Systems	2	0	0	4	60	40	100
			Total	**24.5**	**20**	**0**	**13**	**600**	**500**	**1100**

ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)
FOUR YEAR B.TECH. DEGREE COURSE
Scheme of Instruction and Examination

VII SEM EEE **Scheme-2020**

S. No	Category	Course Code	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination Maximum Marks		
					L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
I			**Theory**							
1.	PEC		Professional Elective-III	3	3	0	0	60	40	100
2.	PEC		Professional Elective-IV	3	3	0	0	60	40	100
3.	PEC		Professional Elective-V	3	3	0	0	60	40	100
4.	OEC		Open Elective-III	3	3	0	0	60	40	100
5.	OEC		Open Elective-IV	3	3	0	0	60	40	100
6.	HSS		Universal Human Values-2	3	3	0	0	60	40	100
II			**Practical**							
1.	SC	SCEE04	Applications of IoT	2	0	0	4	60	40	100
			Summer Internship -II	3	-	-	-	-	100	100
			Total	**23**	**18**	**0**	**4**	**420**	**380**	**800**

VIII SEM EEE **Scheme-2020**

S. No.	Category	Course Title	Credits	Hours per week			Scheme of Examination Maximum Marks		
				L	T	P/D	End Exam Marks	Internal Assessment Marks	Total Marks
1	PROJ	Project Work	6	0	0	12	60	40	100
2	PROJ	Internship	6	0	0	12	-	100	100
		Total	**12**	**0**	**0**	**24**	**60**	**140**	**200**

Professional Elective – I

EE303 Network Theory and Signals & Systems
EE304 Communication Systems
EE305 Digital Control Systems

Professional Elective – II

EE311 Non-Conventional Sources of Energy
EE312 Electrical Distribution Systems
EE313 Digital Design with FPGA

Professional Elective – III

EE401 Power System Operation and Control
EE402 Power Quality and FACTS
EE403 Control Systems Design

Professional Elective-IV

EE404 Elements of Digital Signal Processing
EE405 Electrical and Hybrid Vehicles
EE406 Special Machine & Control

Professional Elective-V

EE407 Utilization of Electrical Power
EE408 Electrical Energy Conservation and Auditing
EE409 Electrical Estimation & Costing

Skill advanced course/ soft skill course*

SCEE01 Introduction to Python Programming
SCCM01 Soft Skills
SCEE02 Programmable Logic Controller
SCEE03 Hybrid Power Systems
SCEE04 Applications of IoT

Open Elective-I

OE301 Optimization Techniques
OE302 Remote Sensing & GIS
OE303 Introduction to JAVA
OE304 Internet of Things
OE305 Scientific Programming with Python
OE306 Introduction to Database Systems
OE307 Ethical Hacking
OE308 Entrepreneurship Development
OE309 Introduction to Information Systems
OE310 Neural Networks & Fuzzy Logic

Open Elective-II

OE311 Renewable Energy Sources
OE312 Industrial Safety
OE313 Web Technologies
OE314 Introduction to cyber Security
OE315 Nano Technology
OE316 Disaster Management
OE317 Project Management
OE318 Advanced Information Systems
OE319 Product Lifecycle Management
OE320 Industry 4.0

Open Elective-III

OE401 Multimodal Transportation Engineering
OE402 Air pollution and control
OE403 Industrial Robotics
OE404 Quality & Reliability Engineering
OE405 Smart Grid Technologies
OE406 Artificial Intelligence and Machine Learning
OE407 Distributed Embedded Systems
OE408 Natural Language processing
OE409 Design Thinking
OE410 Cloud, Micro services & Application
OE411 Block Chain Technologies
OE412 Agile Methodologies
OE413 Augmented Reality & Virtual Reality

Open Elective-IV

OE414 Composite Materials
OE415 Image Processing
OE416 Mobile Computing
OE417 Enterprise systems
OE418 Modern Web Applications
OE419 Cognitive Radio
OE420 Automation & Control
OE421 Human Resources Management
OE422 Design Patterns
OE423 Prestressing Systems
OE424 Additive Manufacturing Technology
OE425 Drone Technology
OE426 Infrastructure for Smart City Development

Mandatory Courses

MC101 Environmental Studies
MC102 Professional Ethics
MC103 Constitution of India
MC104 Essence of Indian Traditional Knowledge

PROBABILITY AND STATISTICAL ANALYSIS (PSA)

III Semester :EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
BS202	Basic Science Course	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of Statistical Methods.

CO2: Understand the concepts of probability theory and random variables.

CO3: Analyze discrete and continuous probability distributions.

CO4: Apply the test of hypothesis for large samples.

CO5: Analyze the Test of significance for small samples and Classification of ANOVA.

UNIT - I	
Statistical Methods	Introduction to statistics, Frequency distribution, Measures of Central Tendency, Measures of dispersion, Moments; Skewness and Kurtosis; Co-efficient of Correlation, Lines of regression and Rank Correlation.
UNIT - II	
Probability and Random Variables	Basic concepts of probability, Addition and Multiplication law of probability, Baye's Theorem; Random variables – discrete and continuous probability distributions and Functions, mean and variance of distributions.
UNIT - III	
Probability Distributions	Binomial, Poisson, Normal, Exponential and Gamma distributions, Evaluation of statistical parameters: Mean and Variance.
UNIT - IV	
Test of Hypothesis for Large Samples	Population and sample, Statistical hypothesis – Null and Alternative hypothesis, Level Significance and Critical region; Large sample test for single proportion, difference of proportions, single mean, difference of means and standard deviations.
UNIT - V	
Test of Significance for Small Samples	Student t-test - sample mean, difference between sample means and paired t-test; F – test, Chi-square test –Goodness of fit and independence of attributes.
Analysis of Variance	ANOVA for One-way classification, ANOVA for Two-way classification.

Text Books :

1. Gupta and Kapur Fundamentals of Mathematical Statistics ; S.Chand & Company
2. T.K.V.iyengar and others-, Probability And Statistics, S.Chand & Company, 5th Edition, 2015.
3. B.S. Grewal [2012], Higher Engineering Mathematics, Khanna Publishers, New Delhi.

Reference Books :

1. K.Murugesan & P.Gurusamy , Probability And Statistics , Anuradha Publications .
2. Probability And Statistics , Murray R Spiegal and others , Schaum's series, Tata Mcgraw Hill Education.
3. Leomard Kazmier , Business Statistics , Schaum's series, Tata Mcgraw Hill Education.

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ANALOG CIRCUITS (AC)

III Semester : Common to ECE & EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EC213	Professional Core Courses	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Ability to know Stabilization, Biasing circuits for BJT, FET & MOSFET. Analyze the effect of cascading on amplifier Circuits,

CO2: Understand small signal low frequency models for JFET and MOSFET amplifier

CO3: Understand the transistor characteristics behavior & performance

CO4: Analyze Negative feedback amplifiers circuits & Oscillators circuits

CO5: Analyze large signal amplifier circuits & Tuned amplifier circuits

UNIT – I	
Small signal low frequency transistor model(h-parameters)	Transistor hybrid Model, Analysis of transistor amplifier using h-parameters, small signal model of BJT, Approximate CE, CB, CC Models, Millers Theorem and its Dual Transistor biasing and bias stabilization: Operating point, Stability factor, Bias compensation techniques, Thermal stability.
Multistage Transistor Amplifiers	Types of coupling-RC coupled, direct coupled, Analysis of two stage RC coupled amplifier, Darlington, Bootstrap and Cascode amplifiers
UNIT - II	
FET and MOSFET Amplifiers:	Small signal model of JFET, Analysis of CS, CD JFET amplifiers. Basic concepts of MOS amplifies, MOS small signal model. Common source amplifiers with resistive, diode and current source loads.
UNIT – III	
Transistor At High Frequencies:	Hybrid-π model, Hybrid-π conductance and capacitances CE short circuit current gain Parameters and fT, Current gain with resistive load, Single stage CE transistor amplifier frequency response, Gain-bandwidth product (GBW), Bandwidth of cascaded amplifier stages. Analysis of CS and CD JFET amplifiers at high frequencies.
UNIT - IV	
Feedback and Oscillator Circuits:	Feedback circuits: concept of feedback – effects of negative feedback – feedback connection types – practical feedback circuits – phase and frequency considerations – designing feedback amplifier circuits. Oscillator circuits: oscillator principles – LC oscillators – RC oscillators – crystal oscillators – designing oscillator circuits.
UNIT - V	
Power Amplifiers and Tuned Amplifiers:	Classes of operation, Class A amplifiers (Series fed, Transformer coupled, Push pull), Second Harmonic distortion, Class B amplifiers (Push pull, Complementary symmetry), Crossover distortion and Class AB operation, Class C amplifiers and efficiency. Transistor power dissipation, Heat sinks. Need of tuned amplifiers, Q-factor, Analysis of single stage capacitive coupled, Effect of cascading on bandwidth of single tuned amplifies, Double Tuned amplifiers, Effect of cascading on bandwidth of double tuned amplifies, Stability

	of Tuned amplifiers.

Text Books

1. Milliman and Halkis: “Integrated Electronics”, Tata McGraw Hill, 2004.
2. R.E.Boylstead and L.Nashelsky: “Electronic Devices and Circuit Theory”, 9/e, Pearson Education,2007.
3. David Bell, “Electronic Devices and Circuits”- 5thEdition, Oxford,2008.
4. DonaldANeamenandDhrubesBiswas,“SemiconductorPhysicsandDevices”,4th EditionTMH,2012.

Reference Books

1. Ben.G. Streetman, “Solid state electronic devices”, Pearson, 2015
2. G. K. Mithal, “Electronic Devices and Circuits”, 23rdEdition, Khanna pub. 2006
3. Bogart Theodore, “Electronic Devices and Circuits“, 6thEdition, PE 2008.
4. Allen Mottershed, “Electronics devices and circuits”, 1stEdition, PHI, 1973.
5. N.N Bhargava, D.C. Kulshreshtha, S.C Gupta, NITTTR – Chandigarh, “Basic Electronics and Linear Circuits”,2ndedition, McGraw Hill Education (India) Pvt Ltd, 2013

Web References:

1. https://www.electronics-tutorials.ws
2. www.informationvine.com

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

DIGITAL SYSTEM DESIGN (DSD)

<table>
<tr><td colspan="5">III Semester : Common to ECE & EEE</td><td colspan="4">Scheme : 2020</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">EC201</td><td rowspan="2">Professional Core Courses</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 1 ½ Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Apply the basic knowledge of number systems, Boolean algebra to solve simple Problems</td></tr>
<tr><td colspan="9">CO2:Understand Boolean algebra, and apply it to minimize and realize Boolean functions</td></tr>
<tr><td colspan="9">CO3:Design various common combinational logic circuits</td></tr>
<tr><td colspan="9">CO4:Design simple sequential logic circuits</td></tr>
<tr><td colspan="9">CO5:Distinguish various types of FSMs and design them by following the standard procedure</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="2">Number System & Boolean Algebra</td><td colspan="7">Binary numbers, Number-base Conversions, Octal and Hexadecimal numbers, complements of numbers, Signed binary numbers, Binary codes, binary logic; Boolean Algebra: basic definitions, basic theorems and properties, Boolean functions, canonical and standard forms, all logic functions of two variables, digital logic gates</td></tr>
<tr><td colspan="9">UNIT - II</td></tr>
<tr><td colspan="2">Minimization & Realization Methods</td><td colspan="7">2,3,4,5 -variable Karnaugh map (K-map) method, prime implicants, essential prime implicants, POS, SOP simplifications, simplifications with don’t-cares conditions, NAND/NOR implementations of digital gates, 2- level and multi-level NAND/NOR realizations, AND-OR-INVERT(AOI),OR-AND-INVERT(OAI), Quine-McCluskey (QM) Technique or Tabulation Method, Programable Logic Devices: PROM, PLA & PAL</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="2">Combinational Logic Design</td><td colspan="7">Combinational circuits: half-adder, full-adder, binary adder, carry look ahead adder, half-subtractor, full-subtractor, binary adder with subtractor, BCD adder, binary multiplier, magnitude comparator, decoder and its applications for combinational logic implementation, encoder, priority encoder, multiplexer (MUX), combinational logic implementation using MUX, hazards in combinational logic.</td></tr>
<tr><td colspan="9">UNIT - IV</td></tr>
<tr><td colspan="2">Sequential Logic Design</td><td colspan="7">Sequential circuit, types of sequential circuits, latches, flip-flops, excitation tables, flip-flop conversions, registers, shift registers and its types, counters: ripple counter, BCD ripple counter, synchronous counter, Ring counter, Johnson counter</td></tr>
<tr><td colspan="9">UNIT - V</td></tr>
<tr><td colspan="2">Finite State Machines Ethics</td><td colspan="7">Mealy and Moore state machines, Algorithmic State Machines, ASM chart, Design examples (ASMD chart), design of synchronous sequential circuits, state reduction, sequence detectors, design examples.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. M. Morris Mano and Michael D Ciletti, Digital Design with an Introduction to Verilog HDL, 5th edition, Pearson, New Delhi,2013</td></tr>
</table>

2. Jain, R. P., Modern Digital Electronics, 4th edition, Tata McGraw-Hill Education, New Delhi, 2010

Reference Books

1. Kumar,Anand. A., Fundamentals of Digital Circuit, 4th Edition, Prentice-Hall India, New Delhi, 2016
2. Fletcher, W.L., An Engineering Approach to Digital Design, Pearson India, 2015
3. Kohavi, Zvi, Switching and Finite Automata Theory, 3rd edition, Cambridge University Press, 2009
4. Roth,Charles H., Fundamentals of Logic Design, 5thEdition, Cengage Learning, 2004
5. Taub, H and D.Schilling, Digital Integrated Electronics, McGraw Hill, New York, 1977

Web References:

1.http://nptel.ac.in/courses/117106086/1
2. http://www.nptelvideos.in/2012/12/digital-systems-design.html
3. http://www.nptelvideos.in/2012/12/digital-circuits-and-systems.html

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELECTRICAL MACHINES-I (EMC-I)

III Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE201	Professional Core Courses	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the constructional aspects, operation and working of dc machines.

CO2: Understand the methods of excitation, voltage build up, characteristics of dc generators and parallel operation.

CO3: Obtain the performance characteristics of dc machines and their speed control methods.

CO4: Understand the constructional aspects, operation and performance characteristics of 1-phase transformer on various load conditions through different testing methods.

CO5: Understand the constructional aspects and operation of 1-phase auto transformer and poly phase transformers.

UNIT – I	
DC Machines	Constructional details, Principle of operation as a generator, armature windings-simplex lap and wave windings, EMF equation. Armature reaction and its effects Methods of improving armature reaction and commutation, numerical problems.
UNIT - II	
Types of DC Generators and their characteristics	Methods of excitation – separately excited and self excited generators, build up of EMF and causes for failure, open circuit characteristics and load characteristics of dc generators, parallel operation of dc generators– load sharing, numerical problems.
UNIT – III	
DC Motor characteristics and Speed control	Principle of operation of motor, Back emf, starters, torque equation, characteristics of dc motors, various applications of dc motor. Losses and efficiency, Speed control of dc motors-armature control, flux control, numerical problems.
Testing of DC Machines	Direct (brake test), indirect (Swinburne's test) and regenerative testing (Hopkinsons' test), Field's test, numerical problems.
UNIT - IV	
1-Phase Transformers	Construction and principle of operation, Operation on no-load and load, Equivalent circuit, phasor diagrams. Losses and efficiency, Regulation, All-day efficiency, Effect of variations of frequency & supply voltage on Iron losses.
Testing of transformers	Open circuit and short circuit tests, Sumpner's test, separation of losses test-parallel operation of transformers, numerical problems.
UNIT - V	
Autotransformer	Autotransformers - comparison with two-winding transformers numerical problems.
Poly-phase Transformers	Poly-phase transformer connections, three-winding transformers, tap changing transformers, Scott connection, numerical problems.

Text Books

1. P.S. Bimbhra, (2009) "Electrical machinery", 7th Edition, Khanna Publishers.

2. I.J. Nagrath& D.P. Kothari, (2004), “Electric Machines”, 3rd Edition, Tata McGrawhill Publishers.
3. A.E. Fitzgerald, C. Kingsley and S. Umans ,“Electric Machinery”, 6th Edition, Tata McGraw-Hill Companies, 2003.
4. P.S. Bimbhra, “Generalized Theory of Electrical machines”, 5th Edition, Khanna Publishers, 2002.

Reference Books

1. H. Cotton, “Electrical Technology”, 7th Edition, CBS Publishers, 2003.
2. Mukherjee and Chakravarthy, “Electrical Machines”, 2nd Edition, Dhanpat Rai Publishers, 2001.
3. Ashfaq Hussain, “Electrical Machines” Second Edition, Dhanpat Rai Publishers.
4. Clayton and Hancock, “The Performance and Design of Direct Current machines”, 3rd Edition, CBS Publishers, 2004.

Web References:

1. www.nptel.ac.in
2. www.mit.edu
3. www.coursera.org

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS (EEMI)

III Semester :EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
EE202	**Professional Core Courses**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand suitable electrical measuring instrument for measuring electrical quantities.

CO2: Understand the operation of instrument transformers and analog instruments for the measurement of frequency, power and energy.

CO3: Understand the working of bridges and potentiometers.

CO4: Understand the operation of DVMs, multimeter and transducer.

CO5: Understand the operation of silicon based micro sensors.

UNIT - I	
Fundamentals	True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis-Simple problems; Statistical treatment of data-Simple problems.
Indicating Instruments	Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Moving iron type (attraction and repulsion), PMMC, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.
UNIT - II	
Instrument transformers	Instrument transformers : Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)
Measurement of power factor	Principle and Operation of Single phase Electrodynamometer Power Factor Meter;
Measurement of Frequency	Principle and Operation of single phase frequency meter- vibrating reed type, - ferro dynamic type meter;
Measurement of power	Principle and Operation of Single phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.
Measurement of energy	Principle and Operation of Single phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by phantom loading.
UNIT - III	
DC Potentiometers	Principle and Operation of D.C. Crompton's potentiometer
Resistance Measurements	Principle of DC bridge balancing, Wheatstone's bridge - Kelvin's double bridge-Megger- Applications.
Measurement of inductance	Principle of AC bridge balancing, Maxwell's inductance capacitance bridge-Anderson's bridge- Applications.
Measurement of	Desauty's Bridge- Applications, Schering Bridge- Applications.

Capacitance	
UNIT - IV	
Digital Voltmeters	Ramp type, Dual Slope integrating type, successive approximation, potentiometric type DVMs.
Electronic Multimeter	Electronic ohmmeter - Resistance measurement with electronic multimeter.
Transducers	Strain Gauge-gauge factor (Expression only, no derivations)-applications of strain gauge; Q-Meter.
UNIT - V	
Silicon based micro sensors	Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)

Text Books :

1. E.W.Golding and F.C.Widdis, "Electrical Measurements and measuring Instruments", Wheeler Publishers
2. A.K.Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publishers
3. J. B. Gupta: "A Course in Electrical and Electronic Measurements and Instrumentation", S.K. Kataria & Sons

Reference Books :

1. Buckingham and Price, "Electrical Measurements", Prentice – Hall
2. Reissland, M.U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers
3. H.S.Kalsi, "Electronic Instrumentation", Tata MCGraw-Hill Edition
4. T. R. Padmanabhan, "Industrial Instrumentation – Principles and Design", Springer

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

INTRODUCTION TO PYTHON PROGRAMMING (IPP)

III Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
SCEE01	**Skill Oriented Course**	**1**	**0**	**2**	**2**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand fundamentals of programming –variables, conditions, Lists, Tuples &Dictionaries.

CO2: Understand Arithmetic, Relational, Assignment, Logical, Bitwise, Membership, Identity Operators and Conditional Statements.

CO3: Impart Functions, Scope of variables, Modules, Packages.

CO4: Comprehend Concepts of File I/O, Exception Handling, Classes and Objects.

CO5: Develop general scientific programming through Matplotlib, and NumPy.

UNIT – I	
Introduction	History of Python, Features, Advantages, Environment setup and Interaction using Command prompt, IDLE, Script mode, IPython Notebook. Basic Syntax: Keywords, Identifiers, Variables.
Data Types	Strings, Numbers, Booleans, Date and Time, Lists, Tuples, Dictionaries
UNIT - II	
Operators	Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators.
Program control statements	Conditional Statements: if, if- else-elif Loops: for, while Control Statements: break, continue, pass
UNIT – III	
Functions	Defining Functions, Calling a Function, Function Arguments: Required arguments, Keyword arguments, Default Arguments, Variable-length arguments, Anonymous Functions, The Return Statement, Scope of the Variables in a Function - Global and Local Variables.
Modules	Defining module, namespacing, Importing modules and module attributes, from. Import statement, Module built-in functions, Introduction to Packages.
UNIT - IV	
Error and Exception	Difference between an Error and Exception, Detecting and Handling Exceptions, Raising Exceptions, Assertions, Built-in Exceptions, User Defined Exceptions.
Files and Input/ Output:	Opening and Closing Files, Reading and Writing Files, Renaming and Deleting Files, Directories in Python.
UNIT - V	
Classes and Objects	Overview of OOP terminology, Creating Classes, Creating Instance Objects, Inheritance, Overriding Methods, Overloading Methods, Operators, Data hiding.
Plotting Functions	Simple plotting with pylab: Basic plotting, Labels, legends and customization, More advanced plotting Matplotlib: Matplotlib basics, Contour plots, heatmaps and 3D plots. NumPy: Basic array methods, Reading and writing an array to a file, Statistical methods, Polynomial, Linear algebra, Matrices, Random sampling, Discrete Fourier transforms

TextBooks :

1. Learning To Program With Python- 2011 Richard L. Halterman
2. Learning Scientific Programming with Python, Christian Hill, Cambridge University Press (2016)

Reference Books :

1. Python Programming-An Introduction to Computer Science 2nd edition-John Zelle 2010
2. Python -The Ultimate Beginner's Guide! , Andrew Johansen
3. Core Python Programming, Wesley J. Chun, Pearson.

Web References:

1. https://www.tutorialspoint.com/python3/
2. https://realpython.com/

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

List of Experiments

1. Write the program for the following:
   a. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
   b. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user.
2. Write a Python program to get the Fibonacci series.
3. Write a Python program to remove the characters which have odd index values of a given string.
4. Write a Python script to sort (ascending and descending) a dictionary by value.
5. Write a Python program to get the largest number from a list.
6. Write a Python program to create a tuple with different data types.
7. Write a Python function to calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument.
8. Design a class that store the information of student and display the same.
9. Implement the concept of inheritance using python
10. Write a program to implement exception handling.
11. Write a program by using Pandas Library.
12. Write a program by using Numpy Library.

PROFESSIONAL ETHICS (PE)

III Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
MC104	**Mandatory Courses**	**2**	**0**	**0**	**0**	**100**	**-**	**100**
Sessional Exam Duration : 1 ½ Hrs								

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the importance of Ethics & Human Values.

CO2: Understand the moral autonomy and uses of Ethical theories.

CO3: Understand the responsibilities of the Engineer towards the society.

CO4: Assess environmental issues to take Protective measures to evade risks.

CO5: Understand various roles of Engineer and help them make the world a better place.

UNIT – I	
Human Values	Morals – Values - Ethics – Morals vs Laws - Integrity - Work Ethics - Respect for Others - Peaceful Life - Honesty - Courage - Valuing Time- Empathy - Character – Spirituality
UNIT – II	
Engineering Ethics	Definition of Engineering Ethics - Varieties of Morals - Types of Inquiry – Kohlberg's Theory –Gilligan's Theory - Consensus & Controversy - Models of Professional Roles - Customs and Religion - Uses of Ethical Theories
UNIT – III	
Engineering As Social Experimentation	Engineering as Social Experimentation - Engineers as responsible experimenters - Codes of Ethics - A balanced Outlook on Law - The Challenger case study
UNIT - IV	
Safety, Responsibilities & Rights	Safety and Risk - Risk Benefit Analysis and Reducing Risk - Collegiality and Loyalty - Respect for Authority - Confidentiality - Occupational Crime - Professional Rights - Employee Rights - Intellectual Property Rights (IPR).
UNIT - V	
Global Issues	Multinational Corporations - Environmental Ethics - Computer Ethics -Engineers as Managers - Consulting Engineers - Moral Leadership - Sample Code of Ethics like ASME, ASCE, IEEE, Institute of Engineers, Indian Institute of Materials Management, IETE etc.

Text Books

1. Jayashree Suresh, B.S.Raghavan, "Human Values and Professional Ethics", S. Chand Publications

Reference Books

1. Mike Martin and Roland Schinzinger , "Ethics in Engineering", McGraw Hill, New York., 1996.
2. Charles D.Fleddermann , "Engineering Ethics", prentice Hall, New Mexico., 1999.
3. S. Dinesh Babu, "Professional Ethics & Human Values", Laxmi publications

ELECTRICAL CIRCUITS LABORATORY (EC(P))

III Semester : EEE						Scheme : 2020	
Course Code	Hours/Week			Credits	Maximum Marks		
EE203	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand the verifications of KCL, KVL, superposition, Maximum power, Thevenin's, Norton's, compensation , and Milliman's theorems.

CO2: Understand the concept of RLC series and parallel resonance, Locus diagrams and coupled circuit.

CO3: Determine the network parameters and transient response of the circuits.

CO4: Understand the average value, rms value, peak and phase values of AC System.

CO5: Simulate the circuits using PSpice.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Verification of KCL & KVL (i) Experiment (ii) Simulation
2. Verification of Maximum Power Transfer Theorem (i) Experiment (ii) Simulation
3. i. Verification of Reciprocity Theorem (i) Experiment (ii) Simulation

   ii. Verification of Superposition Theorem (i) Experiment (ii) Simulation
4. Verification of Thevenin's Theorem (i) Experiment (ii) Simulation
5. Verification of Norton's Theorem (i) Experiment (ii) Simulation
6. Determination of Self & Mutual Inductance.
7. RLC Series & Parallel Resonance
8. RL & RC Locus Diagrams
9. i.Verification of compensation theorem (i) Experiment (ii) Simulation

   ii.Verification of Millman's theorem (i) Experiment (ii) Simulation
10. Determination of average , rms , peak and phase values of AC System.
11. Determination of Z & Y Parameters of Two port network.
12. Determination of ABCD Parameters of Two port network.
13. Digital simulation of an electric circuit (Including dependant sources) to find node voltages and branch currents using PSpice.
14. Digital simulation of an electric circuit to find transient response.
15. Digital simulation of series and parallel resonance using PSpice.

BASIC SIMULATION LABORATORY (BS (P))

III Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
EE204	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Execute programs to verify the basic operations on Matrices.

CO2: Execute programs to generate various signals and verify its operations.

CO3: Execute program to verify KVL, KCL, node voltages, branch current, transient, steady state response of a given circuit using MATLAB/PSIM.

CO4: Develop a model to simulate HWR, FWR and draw locus diagram.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Write a program for basic operations on matrices using MATLAB.
2. Write a program for determining the Eigen values and Eigen vectors using MATLAB.
3. Write a program for generation on various signals and Sequences (periodic and a periodic), such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp using MATLAB.
4. Write a program for operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power using MATLAB.
5. Write a program for finding the real and imaginary of signal using MATLAB.
6. Write a program for finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum using MATLAB.
7. Write a program to perform convolution between signals and sequences using MATLAB.
8. Write a program to find the loop currents and Node voltages of the given circuit in MATLAB.
9. Verify KVL and KCL of the given circuit Using PSim.
10. Verify Reciprocity and Superposition theorem Using PSim.
11. Simulate Transient Analysis of a Linear Circuit using MATLAB simulink.
12. Simulate Steady-State Analysis of a Linear Circuit using MATLAB simulink.
13. Model a circuit for the nodal analysis to compute voltages v_1 and v_2 for a given circuit using MATLAB simulink.
14. a) Simulation of Half wave Rectifier.
    b) Simulation of Full wave Rectifier.
15. Verification of Locus diagrams through simulation.

ELECTRICAL MEASUREMENTS LAB (EM (P))

III Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
EE205	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Determine the unknown Resistance, Inductance and Capacitance using Ac and Dc bridges.

CO2: Understand the calibration of single phase energy meter.

CO3: Understand the measurement of power, power factor in a single phase circuit and real, reactive power in a three phase circuit.

CO4: Extend the range of Ammeter and Voltmeter.

CO5: Understand the working of CRO and Transducers.

CO6: Measure distance, temperature, current, voltage and humidity using sensors.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Measurement of resistance using Wheat stone bridge and Kelvin's Double Bridge.
2. Measurement of inductance using Maxwell's Bridge, Anderson Bridge.
3. Measurement of capacitance using De-Sauty's bridge, Schering Bridge.
4. Calibration of single phase energy meter using direct loading method.
5. Calibration of energy meter using Phantom load kit.
6. Measurement of Power using three-Voltmeter and three-Ammeter methods in a single phase circuit.
7. Measurement of real and reactive power in a three phase circuit.
8. Extend the range of given Ammeter and Voltmeter.
9. Measurement of displacement using LVDT.
10. Study of CRO: Measurement of voltage, current, frequency using lissajous patterns.
11. Measurement of voltage of a given battery and current through divide circuit using Arduino.
12. Measurement of temperature and humidity using Arduino.
13. Measurement of distance of the object using Arduino
14. Measurement of different ranges of temperatures using i)RTD ii)Thermocouple
15. Measurement of load with the help of strain gauges.

CONTROL SYSTEMS ENGINEERING (CSE)

IV Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EE206	**Engineering Science Course**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the behaviour of open loop and closed control systems and mathematical model of electrical and mechanical systems.

CO2: Apply block diagram reduction techniques and Mason's gain formula for finding the transfer function of a given control system.

CO3: Understand standard test inputs, controllers, transient and steady state response for a 2^{nd} order control system for unit step input.

CO4: Apply analytical and graphical techniques to determine the stability of control system in both time and frequency domains.

CO5: Understand concept of compensation, state model, controllability & observability of a systems.

UNIT – I	
Equations and Models of Linear Systems	Open-loop and closed-loop systems, control system components, servomotor, tachometer, synchro, Transfer functions, Determination of transfer function of electrical and mechanical systems, problems.
Block Diagram & Signal flow graph	Block diagram representation and manipulation, signal flow graphs-Mason's gain formula to determine overall system gain of control system, problems.
UNIT - II	
Feedback Characteristics	Feedback and non-feedback systems, effects of feedback, regenerative feedback.
Time Response	Types of input, transient response of second order control system for unit step input, time-domain specifications, steady state error and error constants, proportional, derivative and integral controls.
UNIT – III	
Concept of Stability	Stability of systems - Routh Hurwitz criterion to determine stability of control systems, problems, Relative stability.
Root Locus	Concept of root locus, Procedure to plot root locus, Stability analysis of control system by root locus technique, problems.
UNIT - IV	
Frequency Response:	Frequency domain specifications: resonant peak (Mp) and resonant frequency (Wp) for a second order system, Co-relation between time and frequency response, gain margin (GM) and phase margin (PM).
Frequency Plots	Bode plots, Polar plots, Nyquist stability criterion for control system, problems.
UNIT - V	
Compensation (Without Design)	The necessity of compensation, series and parallel compensation, Realization of basic lead, Lag and lead-Lag compensators.
State Variable Analysis	Introduction, concepts of state, state variables, state vector, state space, state space representation, state model, state model of linear systems, state transition matrix, solution of state equations. Concept of Controllability and Observability.

Text Books

1. Nagrath and Gopal, “Control systems Engineering”, New Age International Publications, 2003.
2. B.C.Kuo , “Automatic Control Systems”, Oxford, 2003.
3. K. Ogata, “Modern control Engineering”, Pearson, 2003.
4. Naresh - K.Sinha, “Control Systems”, New Age International Publishers, 1998.
5. B.S.Manke , “Linear Control Systems”, 1996.

Reference Books

1. Madan Gopal , “Control Systems”, TMH. 2003.
2. Dorf, Bishop, “Modern Control systems”, Addison Wesley,1998.
3. Shaum‟s out line series, “Feedback control systems”, TMH,1986.
4. R.C.Shukla, “Control Systems”, Dhanpat Rai, 2004.
5. Ashok Kumar, “Control Systems”, TMH, 2006.

Web References:

1. https://nptel.ac.in/courses/108106098/
2. https://onlinecourses.nptel.ac.in/noc18_ee41/preview

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

COMPLEX VARIABLES AND NUMERICAL METHODS (CVNM)

IV Semester : ECE & EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
BS204	**Basic Science Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand continuity and analyticity of various complex valued functions.

CO2: Evaluate the Integration and Taylor's and Laurent's series expansion of the complex functions.

CO3: Understand the properties of the Bessel's and Legendre functions.

CO4: Apply Numerical Methods and Principles of Least Square Methods in engineering problems and find interpolating polynomial for the given data.

CO5: Apply Numerical Methods to solve ordinary differential equations.

UNIT – I	
Complex Variables	Analytic functions, Cauchy-Riemann equations (Cartesian and Polar form), Harmonic function, Method to find the Conjugate function, Milne – Thomson method, Conformal Mapping (ez , z 2 , sinz, cosz) , Bilinear Transformation.
UNIT - II	
Complex Integration & Series	Simple and Multiple Connected regions, Cauchy's Integral theorem (without proof), Cauchy's integral formula (without proof),Generalized Integral formula(without proof).Taylor's series, Maclaurin's series and Laurent's series, Residue theorem (without proof), Method of finding residues, Evaluation of real integrals by contour integration, Integration round the unit circle and in the interval (- ∞, ∞).
UNIT – III	
Bessel Functions	Solution of Bessel's equation, Recurrence relations for Jn(x), Generating function, Jacobi series, Orthogonality of Bessel's function.
Legendre Functions	Solution of Legendre's equation, Rodrigue's formula, Legendre polynomials, Generating function, Recurrence relations for Pn(x), Orthogonality of Legendre polynomials.
UNIT - IV	
Numerical Methods	Solution of Algebraic and Transcendental Equations – Method of False Position, Newton – Raphson Method; Solution of Simultaneous Equations – Gauss Seidel iteration method, Curve Fitting – Least Squares Method-Fitting a straight line y = a + b x and parabola y = a + b x + cx2.
Interpolation	Operators, relation between the operators, Newton's forward and backward interpolation formulae. Lagrange's interpolation formula.
UNIT - V	
Numerical Solutions of Ordinary Differential Equations of First Order	Taylor's method, Picard's method, Euler's method, Modified Euler's method; Runge -Kutta methods of second and forth order; Milne's Predictor - Corrector method.

Text Books

1. B.S. Grewal [2012], Higher Engineering Mathematics, Khanna Publishers, New Delhi.
2. K.V Iyengar and others [2013], Engineering Mathematics Vol-3, S.Chand & Co. New Delhi.

Reference Books

1. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI, 2010.
2. Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley and Sons 8th Edition,2008.

Question Paper Pattern:

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End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

POWER SYSTEMS-I (PS1)

IV Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EE207	**Professional Core courses**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the operation of conventional power plants.

CO2: Understand the electrical design of transmission lines.

CO3: Analyze the performances of transmission lines using phasor diagram and A.B,C,D constants.

CO4: Apply the mechanical design of transmission lines.

CO5: Understand the basic concepts of distribution systems and underground cables.

UNIT – I	
Conventional Power Generation Plants	Line diagrams of Thermal Power Station, Hydro Power Station, Gas and Nuclear Power stations. Advantages and disadvantages of the plants. Types of Nuclear reactors and brief description of PWR, BWR and FBR.
UNIT - II	
Transmission Line Parameters	Electrical design of Overhead Transmission Lines – Calculation of Line constants of 1- phase, 3-phase system of symmetrical, unsymmetrical and transposed configurations,Calculation of Line constants of stranded conductor, double circuit 3-phase system using GMD and GMR Concepts.
UNIT – III	
Performance Of Transmission Lines	Classification of Transmission Lines -Short, medium and long line and their model representations - Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines.
UNIT - IV	
Performance of Factors affecting the Transmission line	Skin and Proximity effects, Ferranti effect, Charging Current - Corona - factors affecting corona, critical voltages and power loss due to Corona.
Overhead Line Insulators	Types of Insulators, String efficiency and Methods for improvement, voltage distribution, calculation of string efficiency, Numerical Problems
Sag and Tension Calculations	Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Stringing chart, Numerical Problems.
UNIT - V	
Underground Cables	Types of Cables, Construction, Calculations of Insulation resistance and stress in insulation, Capacitance of Single and 3-Core belted cables, Grading of Cables, Capacitance grading, Inter-sheath grading, Numerical Problems.
DC And AC Distribution	Basic concepts of DC and AC distribution, Distributor fed at one end, Distributor fed at both end. Methods of AC distribution, Power factor referred to receiving end only, Numerical problems.

Text Books

1. C.L.Wadhwa, “Electrical Power Systems”, New Age International (P) Limited, Publishers, 1998

2. V.K Mehta and Rohit Mehta (2004), "Principles of Power Systems", S.Chand & Company, New Delhi.
3. K. Ogata, "Modern control Engineering", Pearson, 2003.
4. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, "A Text Book on Power System Engineering", Dhanpat Rai & Co Pvt. Ltd. 1999.
5. Dr.B.R.Gupta , "Generation of Electric Energy", 6th edition, 2008**,** S.Chand Publisher.

Reference Books

1. John J Grainger William D Stevenson, "Power system Analysis", TMC Companies, 4th edition, 2004
2. Hadi Saadat, "Power System Analysis", TMH Edition. 2002..
3. J.B.Gupta " A Course in Power systems", S.K.Kataria & Sons,2009.

Web References:

1. https://en.wikipedia.org/wiki/Hydroelectricity
2. https://en.wikipedia.org/wiki/Thermal_power_station
3. https://www.electrical4u.com/power
4. http://www.eng.uwi.tt/depts/elec/staff/alvin/ee35t/notes/Transmission
5. http://engineering.electrical-equipment.org/others/underground-cables-advantages-

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELECTRICAL MACHINES-II (EMC-II)

IV Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE208	Professional Core courses	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basics, operation, working and performance characteristics of 3-phase induction motors.

CO2: Understand the operation, working and performance characteristics of 1-phase induction motors and speed control of 3-phase induction motor.

CO3: Understand the basics, operation and working of 3-phase synchronous generators.

CO4: Analyze the performance characteristics of 3-phase synchronous generators.

CO5: Understand the performance characteristics of salient pole synchronous machine and synchronous motors.

UNIT – I	
3-phase induction motor	Constructional features, principle of working of 3-phase induction motor, phasor diagram, rotor input, losses and power flow diagram, torque equation-expressions for maximum torque and starting torque, torque - slip characteristics, equivalent circuit, circle diagram & predetermination of performance, numerical problems
Starting of three phase induction motor	Starting methods: direct online starting, stator reactor starting, autotransformer starting, star-delta starting, rotor resistance starter , starting current and starting torque calculations, numerical problems.
UNIT - II	
Speed control of Induction motors	Speed control – change of frequency, change of poles-methods of consequent poles–cascade connections, rotor resistance method, injection of an emf into rotor circuit (qualitative treatment only), induction generator (qualitative treatment only), numerical problems.
1-phase Induction motors	Principle of working, determination of equivalent circuit parameters – numerical problems. Starting methods and types - split-phase induction motors, capacitor motors, capacitor start motors, two value capacitor motors, permanent split capacitor (PSC) motor & shaded pole induction motors
UNIT – III	
Synchronous Machines	Constructional features, principle of working of Synchronous Machines, Armature windings, integral slot and fractional slot windings(elementary treatment only), distributed, concentrated and chorded windings. Distribution, pitch and windings factors, EMF equation, Armature reaction, numerical problems.
UNIT - IV	
Regulation of Alternators	Regulation of Alternators: Regulation of alternator by synchronous impedance method, M.M.F. method and Z.P.F method, numerical problems
Parallel operation of Alternators	Synchronization of alternators with infinite bus bars, synchronizing power, parallel operation and load sharing, effect of change of excitation and mechanical power input, numerical problems.
UNIT - V	
Salient Pole	Two reaction analysis, experimental determination of X_d and X_q, phasor diagrams,

Synchronous Machine	regulation of salient pole alternators, numerical problems.
Synchronous Motors	Theory of operation, phasor diagram, synchronous condenser, numerical problems

Text Books

1. P.S. Bimbhra, "Electrical machinery", 7th Edition, Khanna Publishers, 2009.
2. I.J. Nagrath & D.P. Kothari, "Electric Machines", 3rd Edition, Tata McGrawhill Publishers, 2004.
3. A.E. Fitzgerald, C. Kingsley and S. Umans , "Electric Machinery", 6th Edition, Tata McGraw-Hill Companies, 2003.
4. P.S. Bimbhra, "Generalized Theory of Electrical machines", 5th Edition, Khanna Publishers, 2002.

Reference Books

1. H. Cotton, "Electrical Technology", 7th Edition, CBS Publishers, 2003.
2. Mukherjee and Chakravarthy, "Electrical Machines", 2nd Edition, Dhanpat Rai Publishers, 2001.
3. Ashfaq Hussain, "Electrical Machines" Second Edition, Dhanpat Rai Publishers.
4. M. G. Say, " The Performance and Design of Alternating Current Machines", CBS Publishers & Distributers PVT. Ltd.,New Delhi, 2005.

Web References:

1. www.nptel.ac.in
2. www.mit.edu
3. www.coursera.org

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY (MEPA)

IV Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
HU201	Humanities and Social Sciences	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the nature and scope of managerial economics and the concepts of demand analysis.

CO2: Understand the significance of demand elasticity and the concepts of demand forecasting.

CO3: Understand the concepts of production and cost analysis and different market structures and their competitive situations.

CO4: Understand the concept and significance of capital budgeting.

CO5: Understand the principles and significance of accountancy and preparation of final accounts.

UNIT – I	
Introduction to Managerial Economics & Demand	Managerial Economics- Definition, Nature and Scope of Managerial Economics Demand Analysis- Meaning, Types of Demand, Demand Determinants, Law of Demand and its exceptions, Nature and Types of Demand, Law of Diminishing Marginal Utility, Indifference curve
UNIT - II	
Elasticity of Demand and Demand Forecasting	Elasticity of Demand-Types of elasticity of demand, measurement, factors influencing and significance of elasticity of demand Demand forecasting– Importance, Factors, Purposes, Methods of Demand forecasting
UNIT – III	
Theory of Production & Cost Analysis and Market Structures	Production Analysis- Meaning, Isoquants & Isocosts, The law of diminishing Marginal Returns, Law of Returns to Scale, Internal and External Economies of scale, Optimum combination of inputs and Producer's equilibrium Cost Analysis– Cost concepts, Cost output relationship for Short Run and Long Run Break Even Analysis– Its Importance, Limitations and Managerial uses Market Structures- Types and features of different market structures, Perfect Competition, Monopoly – Monopolistic and Oligopolistic, Price output determination in case of perfect competition and Monopoly.
UNIT - IV	
Capital and Capital Budgeting	Introduction, definition; significance of Capital Budgeting, Complications involved in capital budgeting decisions, Need for capital budgeting decisions, Steps in Capital budgeting, Methods of Capital budgeting, Traditional methods, Payback period and Accounting rate of return methods, Discounted Cash flow methods- Net present value method, Internal Rate of return method and Profitability index method.
UNIT - V	
Introduction to Financial Accountancy	Principles of Accountancy- Introduction, Double Entry System of Book Keeping, Journal, Ledger, Preparation of Trial balance. Preparation of Final Accounts- Trading Account, Profit & Loss Account, and

	Balance Sheet with adjustments, Final Accounts, problems.

Text Books

1. A.R. Aryasri A.R. Aryasri, Managerial Economics and Financial Analysis,McGrawHill Education.
2. Varshiney and Maheswari, Managerial Economics, Sultan Chand & Co, New Delhi

Reference Books

1. Vanita Agarwal, Managerial Economics, Pearson Education.
2. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson.
3. S.P.Jain and K.L.Narang, Financial Accounting.

Web References:

1. www.springer.com/us/book/9780387970486
2. https://books.google.co.in/books?id=IWRI-5g0uHUC

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

CONTROL SYSTEMS LAB (CS (P))

IV Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
EE209	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand the behaviour of Second order control systems and Servo motors.

CO2: Analyze the stability of a control system in time and frequency domain using MATLAB programming.

CO3: Understand the steady state errors and maximum peak over shoot of Second order control system using PID controller.

CO4: Understand the behaviour of various compensators for control systems.

CO5: Understand the working of Magnetic Amplifier

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Study of Characteristics of A.C.Servo Motor
2. Study of Characteristics of D.C.Servo Motor
3. Study of Stepper Motor Control
4. Study of Compensation Design
5. Study of Characteristics of Synchro pair
6. Study of time response of a system using Linear System Simulator
7. Study of PID controller
8. Study of DC Position Control Systems
9. Analysis of Root Locus plot using MATLAB
10. Analysis of Bode plot using MATLAB
11. Analysis of Polar plot using MATLAB
12. Analysis of Nyquist plot using MATLAB
13. Study of characteristics of Magnetic Amplifier
14. Study of Temperature control system
15. Study of potentiometer

ELECTRICAL MACHINES-I LAB (EMC1 (P))

IV Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
EE210	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes: At the end of the course students will be able to

CO1: Obtain the performance characteristics of DC machines at different loads.

CO2: Perform tests on self-excited DC Motor-Generator Sets.

CO3: Obtain the characteristics of DC Compound Machines.

CO4: Conduct the speed control test and separate the losses test on DC Shunt motor.

CO5: Obtain the performance characteristics of 1-phase Transformers under no load and varying loads.

CO6: Perform tests on 1-phase transformers to separate the losses and to verify Scott connection.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Open circuit characteristic (OCC) of DC shunt generator
2. Load test on DC shunt generator.
3. Brake test on DC compound motor.
4. Swinburne's test on DC shunt Machine.
5. Brake test on DC shunt motor.
6. Hopkinson's test.
7. Field's test.
8. Speed control of DC shunt motor.
9. OC, SC Test on 1-phase transformer.
10. Load test on DC Compound generator.
11. Separations of losses of DC shunt motor.
12. Sumpner's test on two identical single phase transformers.
13. Scott connection (3phase to 2phase conversion) of Transformer
14. Separation of losses in a single phase transformer.
15. Load test on single phase transformer.

ANALOG AND DIGITIAL SYSTEMS LAB (ADS (P))

IV Semester: EEE					Scheme : 2020		
CourseCode	Hours/Week			Credits	MaximumMarks		
EC214	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100
End Exam Duration: 3 Hrs							

Course Outcomes : At the end of the course students will be able to

CO1: Understand the MOSFET amplifier characteristics.

CO2: Analyze the effect of feedback on amplifier characteristics

CO3: Determine the efficiency of Power amplifier

CO4: Design and analyze two stage RC coupled amplifier, Darlington pair

CO5: Analyze Boolean algebra and basic digital circuits

CO6: Design & analysis combinational logic circuits and sequential logic circuits

List of Experiments

1.MOSFET amplifier
a. To design, construct and obtain frequency response of the MOSFET amplifier circuits
b. To measure signal handling capacity, input and output impedance
c. Compare performance practically and through simulation

2. Negative feedback amplifier
a. To design, construct and test response of i. voltage shunt ii. voltage series feedback amplifierswith and without feedback for the given specifications
b.To compare their frequency response through simulation

3.RC oscillators
To design, construct and test the
a. RC Phase shift oscillator b. Wien bridge oscillator for the given specifications

4. Class B complementary symmetry amplifier
To obtain the frequency Vs power and load Vs power characteristics

5.CascadeAmplifier
a. To design, construct and obtain frequency response of a two stage RC coupled amplifier
b. To measure signal handling capacity, input and output impedance
Compare performance practically and through simulation

6. Darlington pair
To design, construct and obtain frequency response practically and through simulation

7. Realization of Boolean Expressions using Gates

8.Implement Full Adder & Full substractors using logic gates

9. Design and realization of BCD to Excess-3 code converter

10.Design and implementation of Boolean Function using MUX

11. Design and implementation of Boolean Function using Decoder

12. Analyze the working of universal shift Register

SOFT SKILLS LAB (SSP)

III/IV Semester : Common for all Branches						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SCCM01	**Skill Oriented Courses**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		0	**0**	**4**	**2**	40	60	**100**

Course Outcomes : At the end of the course students will be able to

CO1: Communicate effectively and enhance their interpersonal relationship building skills with renewed self confidence

CO2: Work together in teams and accomplish objectives in a cordial atmosphere

CO3: Face interviews, GDs and give presentations

CO4: Understand and develop the etiquette necessary to present themselves in a professional setting

CO5: Learn the Principles of Personal effectiveness

List of Activities

1. Ice breaking Activities, Principles of Time and Stress Management
2. Art of speaking
3. Art of writing - Essay / Picture / Story
4. Business etiquette - Telephone and email
5. Presentation Skills - Power point making
6. Group Discussion – Objectives and Skills tested in a GD, types of GD, Dos and don'ts & practice
7. Team work - Drama / Skit / Role play
8. Paper / Poster Presentation
9. Problem Solving by lateral thinking puzzles
10. Know your General Awareness / Knowledge – Quiz
11. Principles of Personal excellence
12. Interview Skills

Reference Books :

1. Stephen R. Covey, “The Seven Habits of Highly Effective People”, Pocket Books Publishers, London
2. Priyadarshani Patnaik, “Group Discussion and Interview Skills with VCD”, Foundation Books.
3. Sangeeta Sharma & Binod Mishra, “Communication Skills for Engineers and Scientists”, PHI Learning Private Limited.
4. Shiv Khera, “You Can Win”, MacMillan India Publishers, New Delhi
5. Campus Connect Portals - TCS - https://campuscommune.tcs.com; Infosys - http://campusconnect.infosys.com/

POWER ELECTRONICS-I (PEL1)

V Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE301	Professional Core	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the working and characteristics of power semi conductor devices like diode, SCR, BJT TRIAC, MOSFET & IGBT.

CO2: Understand the principle of operation and performance of 1-Φ half and fully controlled bridge converters with R and RL loads.

CO3: Understand the principle and operation of 3-Φ half, fully controlled bridge converters and dual converters with R and RL Loads.

CO4: Understand the performance of converter fed separately excited DC motor.

CO5: Understand the working of single and multi quadrant chopper with R, RL and separately excited DC motor.

UNIT – I	
Basics of Power Electronics	Introduction to power electronics, scope and applications, power semiconductor switches (Diodes, SCR, TRIAC, BJT, MOSFET and IGBT), SCR triggering & commutation methods (Qualitative treatment only).
UNIT – II	
1-Φ Controlled Rectifiers	1-Φ half and fully controlled bridge converters with R and RL load. Performance analysis of 1-Φ half and fully controlled bridge converters with continuous mode of operation, power factor improvement schemes. Simple Problems.
UNIT – III	
3-Φ Controlled Rectifiers and Dual converters	3-Φ half and fully controlled bridge converters with R and RL loads. Derivation of RMS and average values. 1-Φ and 3-Φ Dual converters with circulating and non-circulating current mode of operation. Simple problems.
UNIT – IV	
Rectifier controlled Separately Excited DC motor	Speed control and braking methods of separately excited DC machines. 1-Φ and 3-Φ half and fully controlled bridge converter fed separately excited DC motor under continuous current mode of operation – output voltage and current waveforms, speed-torque expressions and characteristics. Simple problems.
UNIT – V	
DC Choppers	Introduction to choppers- control strategies, principle and operation of step-down and step –up choppers, time domain analysis of step down chopper. Classification of choppers. Step-down chopper fed dc separately excited motor under continuous current mode of operation – output voltage and current waveforms, speed-torque expressions and characteristics. Closed loop operation of DC drive (block diagram only). Simple problems.

Text Books :

1. P.C. Sen, "Power Electronics", 35th Reprint, Tata McGraw Hill Publishers. 2010
2. M.H. Rasheed, "Power Electronics Circuits Devices and Applications", 3rd Edition, PHI publishers. 2004
3. P.S. Bimbhra, "Power Electronics", 4th Edition, Khanna publishers. 2010

4. G.K. Dubey, “Fundamentals of Electrical drives” 2 nd Edition, Narosa Publishers. 2001.
Reference Books :
1. Ashfaq Ahmed, “Power Electronics for Technology” First Indian Reprint, Pearson Education Publishers. 2003
2. G.K. Dubey, “Power Semiconductor controlled drives”, Prentice-Hall, Englewood Cliffs, Publishers. 1989.
3. M.D. Singh and K.B. Khanchandani , “Power Electronics”, 2nd Edition, Tata McGraw Hill Publishers. 2002.
Web References:
1. https://nptel.ac.in/downloads/108105066/
2. https://nptel.ac.in/courses/108101126/
3. https://nptel.ac.in/syllabus/108108077/
4. https://www.youtube.com/watch?v=Coy-WRCfems
Question Paper Pattern:
Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section. **End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

POWER SYSTEMS-II (PS2)

V Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EE302	**Professional Core**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand per unit quantities, symmetrical component theory and apply for short circuit analysis and shunt fault calculations.

CO2: Understand steady state, transient and dynamic stabilities in power system.

CO3: Apply swing equation, equal area criterion to estimate transient stability.

CO4: Understand the need for power flow studies and obtain load flow solution using GS method.

CO5: Apply NR and FDC methods for load flow studies.

UNIT – I	
Short Circuit Analysis-I	Per-Unit System, Per-Unit equivalent reactance network of a three phase power system. Short circuit current and MVA calculations, fault levels, application of Series Reactors. Numerical problems.
Short Circuit Analysis-II	Symmetrical component theory, symmetrical component transformation, positive, negative and zero sequence components of voltages, currents and impedances.
Unsymmetrical Fault Analysis	Positive, negative and zero sequence networks. LG, LL, LLG faults with and without fault impedance and LLL fault. Numerical Problems.
UNIT – II	
Power System Steady State Stability Analysis	Elementary concepts of steady state, dynamic and transient stabilities. Steady state stability power limit, transfer reactance, synchronizing power coefficient, power angle curve and determination of steady state stability, methods to improve steady state stability, numerical problems.
UNIT – III	
Power System Transient State Stability Analysis	Derivation of swing equation. Determination of transient stability by equal area criterion and its applications. Solution of swing equation by Point-by-Point method, methods to improve transient stability.
UNIT – IV	
Power flow Studies-1	Necessity of power flow studies, types of buses, load flow solution using Gauss Seidel method with and without P-V buses, numerical load flow Solution for simple power systems (Max. 3-Buses).
UNIT – V	
Power flow Studies-2	Newton Raphson Method in rectangular and polar co-ordinates: Load flow solution with and without PV busses, derivation of Jacobian elements, algorithms and flowcharts. Decoupled and Fast Decoupled Methods, comparison of different methods.

Text Books

1. C.L.Wadhwa, "Electrical Power Systems", New Age International (P) Limited, Publishers, 1998
2. J.Nagarath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill, 2nd Edition. 2004
3. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, "A Text Book on Power System Engineering", Dhanpat Rai & Co Pvt. Ltd. 1999..

4. W.D.Stewenson Jr, “Elements of power system analysis” McGraw-Hill, 1982.
5. B.R.Gupta, “Power System Analysis and Design”, S. Chand Publishing. 1998.

Reference Books

4. John J Grainger and William D Stevenson, “Power system Analysis”, TMH, 4th edition, 2004
5. Hadi Saadat, “Power System Analysis”, TMH Edition. 2002..
6. J.B.Gupta “ A Course in Power systems”, S.K.Kataria & Sons,2009.

Web References:

1. https://www.chegg.com/homework-help/definitions/unsymmetrical-faults-and-symmetrical-components-4
2. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/chapter_7/7_2.html
3. https://www.chegg.com/homework-help/definitions/sequence-impedances-and-sequence-networks-4
4. https://gradeup.co/load-flow-methods-i-e3525295-bdc8-11e5-a334-83f7a2af1075
5. https://www.electrical4u.com/load-flow-or-power-flow-analysis

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

INTEGRATED CIRCUITS AND MICROPROCESSORS (ICMP)

V Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EC318	**Professional Core**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic concepts of IC 741 Operational Amplifier

CO2: Understand the basic application circuits of op-amp with negative and positive feedback

CO3: Understand the principle of operation and applications of IC 555 timer and data converters

CO4: Understand the definition, architecture and special features of 8086 microprocessor.

CO5: Apply the programming model of 8086 microprocessor to frame assembly language programs

UNIT – I

Op-Amp Fundamentals	Differential amplifier: Basic operation, CMRR and its characteristics. Op-amp ideal characteristics, Study of typical IC op-amp and its different stages, Practical inverting and non-inverting op-amp DC characteristics: i/p bias current, i/p offset current, Offset voltages, Offset balance, Thermal drift, AC characteristics: frequency response, stability of op-amp, Frequency compensation, Slew rate, op-amp parameters, Features of 741 op-amp.

UNIT - II

Op-amp Applications-I **Op-amp Applications-II**	Summing amplifier, Difference amplifier, Current to voltage and voltage to current converters, Instrumentation amplifier, Clippers and clampers, Precision AC to DC converters, Integrator, Differentiator, Log & antilog amplifier, Sample and hold circuits. Comparators, window detector, Schmitt trigger, Pulse, Square and triangle wave generators.

UNIT – III

Timers & Waveform Generators	555 Timer: Astable and Monostable modes and their Applications.
D/A and A/D Converters	Weighted resistor, R-2R ladder type and inverted R-2R ladder, ADCs: Parallel comparator type, Successive approximation and dual slope types, Specifications of converters.

UNIT - IV

Introduction of Microprocessors	8-bit Microprocessors, Block Diagram, Register Organization.
8086 Microprocessor	Comparison of 8-bit with 16-bit Microprocessors, 8086 CPU Architecture, Pin Description, Register Organization, Flag Register, Segmented Memory, Calculation of Physical Address, and Physical Memory organization.

UNIT - V

8086 Programming model	Instruction Format, Addressing Modes, 8086 Instruction Set, Basic Assembler Directives – DB, DW, ORG, END, and EQU. Simple programs on Arithmetic Operations-Addition, Subtraction, Multiplication, Division. Sorting Programs-Ascending & Descending, Searching, Code Conversions- BIN to Unpacked BCD & BCD to BIN, and String Manipulations.

Text Books
1. Roy Choudhury & Shail B.Jain, Linear Integrated Circuits, 4/e, New Age Int. Pub. 2010.
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4/e, PHI, 2003.
3. Moris Mano, Digital Logic and Computer Design, Pearson Ed., 2011.
4. A K Ray, K M Bhurchandi, *Advanced Microprocessors and Peripherals*, 2nd Edition, Tata McGraw Hill Education Private Ltd, 2010.
5.Mazidi Muhammad Ali, Mazidi Janice Gillespie & McKinlay Rolin D, The 8051 Microcontroller and Embedded Systems, 2nd Edition, Pearson Education, 2008.
Reference Books
1. S. Salivahanan, V.S.K. Bhaaskaran, Linear Integrated Circuits, TMH, 2008.
2. Anand Kumar, Pulse and digital Circuits, PHI, 2/e, 2010.
3. R.P. Jain, Modern Digital Electronics, TMH, 3/e, 2003.
4. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, Microprocessors and Interfacing, OUP India, 2012
5. Gaonkar Ramesh, Microprocessors Architecture, Programming & Applications with 8085/8080A, 5th Edition, Penram International publication Ltd, 2010
Web References:
1. http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
2. https://www.youtube.com/watch?v=nb11AipMJd4
3.https://www.youtube.com/watch?v=9Rt7iuqSVJ8
4.www.nptel.onlinecourseac.in/.microprocessorsandmicrocontrollers
5.https://onlinecourses.nptel.ac.in/noc18_ec03/
Question Paper Pattern:
Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section. **End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

CONSTITUTION OF INDIA (CI)

V Semester : Common for all Branches						Scheme : 2020		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
MC103	Mandatory Course	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		2	-	-	-	100	-	100

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the formation and principles of Indian Constitution.

CO2: Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State legislature.

CO3: Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule.

CO4: Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section.

CO5: Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.

UNIT - I

Historical back ground – Significance of Constitution – Making of the constitution – Role of the Constituent Assembly –Salient features – Preamble –Citizenship – Procedure for amendment of Constitution –Fundamental rights – Derivative Principles of state policy – Elections in India.

UNIT - II

Union Executive: Structure of the Union Government & its functions – President – Vice- President – Prime Minister – Cabinet – Parliament.
State Executive: Structure and functions – Governor – Chief Minister – Cabinet – State Legislature.

UNIT - III

Central-State Relations, President's Rule – Constitutional Amendments [42, 44, 74, 76, 86 & 91] – Constitutional functionaries – Working of Parliamentary system in India.

UNIT - IV

Indian Social Structure – Languages in India – Political Parties & Pressure groups – Rights of Women – S.Cs, S.Ts & other weaker sections.

UNIT - V

Judiciary: Structure, Organisation of Judiciary – Independence of the Judiciary – Role and functions of Supreme Court, High Courts & Sub ordinate Courts – Judicial Review.

Text Books :

1. Durga Das Basu, Introduction to the Constitution of India, Wadwa& Company
2. Macivel, Page, An Introduction Analysis Society
3. M.V. Pylee, Indian Constitution, S. Chand Publications
4. Subhash C Kashyap, Our Constitution, National Book Trust of India.
5. Dr. S.M.Rajan ,Constitutional Law of India

Reference Books :

1. The Constitution of India, By the Ministry of Law and Justice, The Govt. of India.
2. C. KashyapSubhasah, Constitutional Law of India
3. M.P.Jain, Indian Constitution Law
4. H.M. Seervai, Constitutional Law of India

Web References:

1. https://www.india.gov.in/my-government/constitution-india

ELECTRICAL MACHINES –II LABORATORY (EMC2 (P))

V Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
EE306	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes: At the end of the course students will be able to

CO1: Apply EMF, MMF and ZPF methods to find the regulation of non-salient pole alternator.

CO2: Analyze the characteristics of synchronous machines through experimentation.

CO3: Determine the performance characteristics of Induction machines through simulation and experimentation.

CO4: Apply slip test on salient pole synchronous machines to determine the reactances and regulation.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

16. Regulation of an alternator using EMF Method and MMF method.
17. Regulation of an alternator using ZPF Method.
18. Brake test on three phase squirrel-cage induction motor.
19. No – load test and Rotor blocked tests on three phase squirrel-cage induction motor.
20. No – load test and Rotor blocked tests on single phase induction motor.
21. Slip test on alternator to determine the X_d and X_q reactances.
22. Synchronization of alternators and V & Λ curves of synchronous machine.
23. Load test on Alternator.
24. Performance characteristics of Induction Generator.
25. Performance characteristics of Universal Motor.
26. Regulation of salient pole Alternator.
27. Load test on single phase squirrel-cage induction motor.
28. Simulation of 1-phase induction motor.
29. Simulation of 3-phase induction motor.
30. Simulation of Torque Vs Speed characteristics of 3-phase Induction motor.

INTEGRATED CIRCUITS AND MICROPROCESSORS LABORATORY (ICM (P))

V Semester : EEE						Scheme : 2020	
Course Code	Hours/Week			Credits	Maximum Marks		
EC319	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Design and very inverting and non-inverting amplifiers, precision rectifiers using op-amp 741

CO2: Design and very the operation application circuits using IC 741 to perform mathematical operations such as addition, subtraction, differentiation and integration

CO3: Verify the operation of 555 timer in two modes.

CO4: Verify the operation of op-amp based digital to analog converter

CO5: Execute 8086 programs using addressing modes and instruction set on trainer kit

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Inverting and non-inverting amplifiers
   a. To design and verify the operation of amplifiers using op-amp IC741, in inverting and non- inverting mode
   b. To obtain frequency response and bandwidth of amplifiers
2. Summing and difference amplifiers
   a. To design application circuits using IC 741 to perform mathematical operations such as addition, subtraction.
   b. To study the operation of circuits by comparing the theoretical values with practical values
3. Integrator and Differentiator
   a. To design circuits using IC 741 to perform mathematical operations of Integration and differentiation
   b. To study the performance of circuits by applying different input waveforms.
4. To study the operation of Half-wave rectifier circuits constructed usingIC741.
5. To study the operation of Full-wave rectifier circuits constructed usingIC741.
6. To design multivibrator circuits using IC 555 Timer in monostable and astable modes for given specifications
7. To study the performance of the circuits and obtain width of o/p pulse from monostable and frequency of o/p square wave from astable circuit.
8. Digital to Analog Converter
   a. To study the performance of R-2R ladder type digital to analog converter.
   b. To calculate values of LSB, MSB and full scale o/p voltage theoretically and practically
9. Execute the 8086 assembly language programs on arithmetic operations
10. Execute the 8086 assembly language programs on series of data operations
11. Execute the 8086 assembly language programs on factorial of a number.
12. Execute the 8086 assembly language programs on Fibonacci series generation.
13. Execute the 8086 assembly language program on convert Binary to unpacked BCD
14. Execute the 8086 assembly language program on convert BCD to Binary
15. Execute the 8086 assembly language program to interface and program an LCD

PROGRAMMABLE LOGIC CONTROLLERS (PLC (P))

V Semester : EEE						Scheme : 2020	
Course Code	Hours/Week			Credits	Maximum Marks		
SCEE02	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	-	-	4	2	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand the functions of PLC

CO2: Apply ladder programming for various applications

CO3: Understand different starting methods of induction motor using contactors and sensors

CO4: Understand and control of conventional and special machines

List of Experiments

1. Verification of logic gates, timer and counter with PLC
2. Traffic Light Control using PLC
3. Automatic water level control system using PLC
4. Direct On line (DOL) Starting of Induction Motor with/without latching
5. Speed Control of DC Motor using POT
6. Servo motor control using PLC
7. Conveyor belt based automatic water bottle filling system using PLC
8. Automatic Temperature control of Geyser using PLC
9. Two flour Elevator system using PLC
10. Reverse Direct On line (RDOL) Starting of Induction Motor with/without latching
11. PLC based Pneumatic machine control
12. Stepper Motor Control using PLC
13. Sensor based automatic water bottle filling system using PLC
14. Colour mixing system using PLC
15. Star Delta Starting of Induction Motor
16. Sensor based DOL and RDOL Starting of Induction Motor
17. Sensor based Star Delta Starting of an Induction Motor
18. Automatic fault detection and protection of induction motor using PLC
19. PLC based DOL and RDOL Starting of Induction Motor
20. PLC based Star Delta Starting of Induction Motor

POWER SYSTEMS – III (PS3)

VI Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE307	Professional Core	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	0	0	3	40	60	100
Sessional Exam Duration : $1\frac{1}{2}$ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the principle and working of protective relays.

CO2: Understand the principle of operation of microprocessor based protective relays.

CO3: Understand the power system transient phenomena and neutral grounding.

CO4: Analyze the principle and working of circuit breakers.

CO5: Analyze the protection schemes employed for alternators, transformers, feeder and bus-bar.

UNIT – I	
Relays	Definitions -Relay Setting (PSM, TMS), principle of operation of Over current relays, Directional relays, Differential Relays and Percentage Differential Relays. Distance Relays-Universal torque equation, Impedance, Reactance, Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays-Basic concept of Static Relay, advantages and disadvantages.
UNIT – II	
Microprocessor based protective Relays	Introduction to Numerical Relays, advantages of Numerical Relays, Microprocessor based Over current relays, Directional relays, Impedance relay, Reactance relay and Mho relay (Block diagram and flow chart approach only)
UNIT – III	
Power System Transients	System transients and its types, travelling wave phenomena, attenuation, distortion, reflection and refraction coefficients, termination of lines with different types of conditions - open circuited line, short circuited line and T-Junction , numerical problems.
Neutral Grounding	Effects of ungrounded neutral on system performance, arcing grounds, resonant grounding. Methods of neutral grounding: solid, resistance and reactance grounding. Numerical problems.
UNIT – IV	
Circuit Breakers	Elementary principles of arc interruption, Restriking phenomenon, restriking and recovery voltages, average and maximum RRRV. Current Chopping and resistance switching, CB ratings and specifications. Description and operation of oil circuit breakers, air circuit breakers, vacuum and SF_6 circuit breakers, advantages and disadvantages, Auto reclosures. Numerical problems
UNIT – V	
Generator Protection	Protection of generators against stator faults, rotor faults, and abnormal conditions, numerical problems
Transformer Protection	Protection of transformers: Percentage differential protection, protection against magnetizing inrush currents, Buchholz relay protection. Numerical problems
Feeder and Bus-Bar Protection	Protection of Lines: Over current, three-zone distance relay protection using impedance relays. Differential protection of Bus bars,.

Text Books :

1.Y.G. Paithankar and S.R.Bhide , “Fundamentals of Power System Protection”, PHI 2003

2.Badari Ram , D.N Viswakarma, “Power System Protection and Switchgear”, TMH Publications 2005

3.C.L.Wadhwa , “Electrical Power Systems”, 3rd edition New Age international (P) Limited, Publishers, 2010

Reference Books :

1. Sunil S Rao, “Switchgear and Protection”, Khanna Publlishers,1995

2.B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, “A Text book on Power System Engineering”, Dhanpat Rai & Co., 2006

Web References:

1. https://circuitglobe.com/electromagnetic-relay.html
2. http://electrical-engineering-portal.com/distance-relays
3. http://www.academia.edu/9285881/REVIEW_OF_MICROPROCESSOR_BASED_PROTECTIVE_RELAYS
4. https://www.crcpress.com/Power-System-Transients-Theory-and-Applications/Ametani-Nagaoka-Baba-Ohno/p/book/9781466577848#googlePreviewContainer
5. https://www.electrical4u.com/electrical-circuit-breaker-operation-and-types-of-circuit-breaker/
6. https://www.eng.uwo.ca/people/tsidhu/Documents/Microsoft%20Word%20-%20STATOR%20PROTECTION.%20final%20report.doc.pdf

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

POWER ELECTRONICS-II (PEL2)

VI Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE308	Professional Core	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the working of cycloconverters and AC voltage controllers with R and RL loads.

CO2: Understand the working of 1-Φ half and full bridge, 3-Φ full bridge voltage source inverters.

CO3: Understand voltage control and harmonic reduction methods for VSI and operation of CSI.

CO4: Understand speed control methods for induction motor and synchronous motors using converters.

CO5: Understand power electronic applications.

UNIT – I	
Cycloconverters and AC voltage Controllers	Basic principle of 1-Φ to 1-Φ (step up and step down) cycloconverters with R and RL loads. 3-Φ to 1-Φ, 3-Φ to 3-Φ cycloconverters circuits (principle of operation only with waveforms). 1-Φ AC voltage controller with R and RL loads, wave forms, derivation of RMS load voltage, current and power factor, simple problems. 3-Φ AC voltage controllers with R load (principle of operation only with waveforms).
UNIT – II	
Voltage Source Inverters	1-Φ half and full-bridge inverters with R and RL loads, 3-Φ bridge VSI with 180° and 120° modes of operations, Fourier analysis of output voltage, expression for RMS voltage. Simple problems.
UNIT – III	
PWM Techniques	Voltage control and harmonic reduction of output voltage using pulse width modulation techniques for 1-Φ (single, multiple and sinusoidal PWM methods) and 3-Φ inverters (sinusoidal PWM method). (Qualitative approach only)
Current Source Inverters	Principle of operation of CSI, 1-Φ capacitor commutated and auto sequential commutated inverters (simple problems). 3-Φ current source bridge inverter (Qualitative approach only). Comparison of CSI and VSI..
UNIT – IV	
Speed Control of Induction Motors	Variable voltage control, variable frequency constant voltage and v/f control of induction motor, speed torque characteristics (simple problems). Static rotor resistance control, slip power recovery schemes–Static Scherbius drive, Static Kramer drive, speed torque characteristics (Qualitative approach only).
UNIT – V	
Speed control of synchronous motors	Review of speed torque characteristics of synchronous motors, separate and self control of synchronous motor (with load commutated inverter).
Applications of Power Electronics	Uninterruptible Power Supply (UPS), Simple Battery Charger, Switched mode power supply (SMPS). (Qualitative approach only).

Text Books :

1. M.H. Rasheed, "Power Electronics Circuits Devices and Applications", 3rd Edition, PHI publishers. 2004
2. P.S. Bimbhra, "Power Electronics", 4th Edition, Khanna publishers. 2010

3. G.K. Dubey, “Fundamentals of Electrical drives” 2 nd Edition, Narosa Publishers. 2001
4. B.K.Bose, “Modern Power electronics and ac drives”, Pearson Education Publishers. 2003

Reference Books :

1. M.D. Singh and K.B. Khanchandani , “Power Electronics”, 2nd Edition, Tata McGraw Hill Publishers. 2002.
2. Vedam Subrahmanayam, “Electrical drives concepts and applications”, Tata McGraw Hill publishers.2008.
3. G.K. Dubey, “Power Semiconductor controlled drives”, Prentice-Hall, Englewood Cliffs, Publishers. 1989.

Web References:

1. https://nptel.ac.in/downloads/108105066/
2. https://nptel.ac.in/courses/108101126/
3. https://nptel.ac.in/syllabus/108108077/
4. https://www.youtube.com/watch?v=Coy-WRCfems

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

MICROCONTROLLERS (MC)

VI Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE309	Professional Core	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the architectural features and I/O Functions of Microcontroller 8051.

CO2: Understand the architectural features and I/O Functions of MSP430.

CO3: Understand architectural features, various instructions, I/O Functions and serial peripherals of Arduino.

CO4: Understand the pin configuration of Node MCU, ESP32 and architectural features of Raspberry PI.

CO5: Understand the basics of IoT, Communication models and M2M.

UNIT – I	
8051 Microcontroller	8051 Microcontroller Architecture, Input / Output ports and circuits, External memory, counters and Timers, Serial data input/output, interrupts.
UNIT – II	
MSP430 Microcontroller	MSP430 CPU Architecture, System Buses, Memory Organization - I/O Subsystem Organization - General Features: Low-power Philosophy- Oscillators and Clocks, Pin layout of MSP430 and Configuring of GPIO Ports. Electrical Characteristics in I/O Pins.
UNIT – III	
Arduino UNO Microcontroller	Board Description - Pin layout of arduino UNO micro controller – Architecture of Arduino Micro-controller.
NodeMCU controller	Board Description - Pin layout of NodeMCU Development Board.
UNIT – IV	
ESP32 controller	Board Description - Pin layout of ESP32 Development Board.
Raspberry Pi controller	Board Description - Pin layout of Raspberrry PI Development Board.- Architecture - CPU Overview - CPU Pipeline Stages - CPU Pipeline Flow - CPU Cache Organization- Branch Prediction - Branch Folding.
UNIT – V	
Introduction to IoT	Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Levels of IoT, Communication models & APIs
IoT & Machine to Machine	Machine to Machine, Difference between IoT and M2M, Software define Network

Text Books :

1. Kenneth J. Ayala, “The 8051 Microcontroller”, Penram International Publication Ltd, 2006.
2. John H Davies, “MSP430 Microcontroller Basics”, Newnes Publications, Elsevier, 2008
3. Simon Monk , “ Programming Arduino: Getting Started with Sketches”, McGraw Hill, 2nd Edition,
4. Simon Monk, “ Programming the Raspberry Pi: Getting Started with Python”, McGraw-Hill Education, Edition:2, 2015.
5. Jeff Cicolani, “Beginning Robotics with Raspberry Pi and Arduino: Using Python and OpenCV”, Apress, 1st ed, 2018,
6. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”, Orient Blackswan

Private Limited - New Delhi; First edition

Reference Books :

1. Chris Nagy, Embedded Systems Design using TI MSP430 Series, Newnes Publications, Elsevier, 2003.

2. Blum Richard, “Arduino Programming in 24 Hours”, Sams Publishers, 1st Edition.

Web References:

1. https://www.ti.com/

2. https://www.arduino.cc/

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELECTROMAGNETIC FIELDS (EMF)

VI Semester: EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE310	Professional Core	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1:	Apply three dimensional orthogonal coordinate systems and vector algebra to solve problems related to field theory.
CO2:	Apply basic laws of electrostatics for various electric field related problems /applications.
CO3:	Apply principles of electrostatics to discern the behavior of electric field in free space, material space.
CO4:	Apply basic laws of magnetostatics and obtain parameters related to magnetic circuits.
CO5:	Understand Maxwell's equations for static and time varying fields

UNIT – I	
Coordinate Systems and Transformation	Cartesian, Cylindrical and Spherical coordinates & their transformations- Differential length, area and volume in three coordinates.
Vector Calculus	Significance of unit vector, scalar and vector projection of a vector, addition, subtraction and multiplication of vectors, operations - divergence, gradient, curl- irrotational and solenoidal fields.
UNIT – II	
Electrostatics	Definition of field, Coulomb's Law, Electric Field Intensity (EFI) – EFI due to point, line and surface charge distribution , Electric Flux Density - Gauss's law, Application of Gauss's Law, divergence theorem (statement only), Maxwell's first equation $(\nabla.\bar{D}) = \rho_v$, Work done in moving a point charge in an electrostatic field, Electric Potential – Potential due to point, line and surface charge distributions, gradient of potential, Poisson's and Laplace's equations, conservative field, Maxwell's second equation$(\nabla X\bar{E} = 0)$, energy stored and energy density in a static electric field, Numerical problems.
Capacitor and Capacitance	Capacitance – Calculation of capacitance due to parallel plate, cylindrical and spherical capacitors using Laplace's equations, Multiple dielectric capacitors, and energy stored in a capacitor, Numerical problems.
UNIT – III	
Electric fields in Material space	Classification of materials – Conductors, Insulators and Semiconductors; Behaviour of conductors and insulators in an electric field, polarization, conduction and convection current densities, permittivity, dielectric strength, Boundary conditions.
UNIT – IV	
Magnetostatics	Biot - Savart's law, Magnetic field intensity (MFI) – MFI due to a straight current carrying filament, Magnetic flux density, Ampere's circuit law - Ampere's circuit law applications, MFI due to a straight current carrying filament, circular, solenoid current carrying wire, Maxwell's third equation $(\nabla X\bar{H}) = \bar{J}$, Maxwell's fourth equation $(\nabla.\bar{B} = 0)$.
Magnetic Force and Inductance	Magnetic force on a moving charge in a magnetic field, Force on a current element in a magnetic field, Force between two straight long and parallel current carrying conductors, Lorentz force equation, Self and mutual inductance; Determination of

	self inductance of a solenoid and toroid, Analogy between electric and magnetic circuits.
UNIT – V	
Time Varying Fields	Faraday's laws of electromagnetic induction, Static and dynamic induced emf's, Displacement current, Maxwell's equations for time varying fields - Comparison of Maxwell's equations for time invariant and time varying fields (integral and point form).

Text Books

1. Matthew N O Sadiku, "Principles of Electromagnetics", Oxford University Press, 4th Edition.
2. William H. Hayt & John. A. Buck, "Engineering Electromagnetics", Mc. GrawHill Companies, 7th Edition, 2006.

Reference Books

1. Joseph Edminister, "Electromagnetics", 2nd Edition, Schaum's outline series TMH, 2004.
2. S.Sivanagaraju , C.Srinivasa Rao, "Electromagnetic Fields", New Age publishers, India,2008.

Web References:

3. https://nptel.ac.in/courses/108/106/108106073/
4. https://www.youtube.com/watch?v=ZRvXEAzfP0A&list=PLVd_4SAWgKyqwxjVXzlX0ZzFMNZpCiyfB&index=1
5. https://www.youtube.com/watch?v=wcFKhanj5ag

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (EITK)

VI Semester: EEE						Scheme: 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
MC104	Mandatory Course	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		2	-	-	-	100	-	100

Course Outcomes: At the end of the course students will be able to

CO1: Understand the concept of Traditional knowledge and its importance.

CO2: Explain the need and importance of protecting traditional knowledge.

CO 3: Illustrate the various enactments related to the protection of traditional knowledge.

CO 4: Interpret the concepts of Intellectual property to protect the traditional knowledge.

CO 5: Understand the traditional knowledge in different sectors.

UNIT-I

INTRODUCTION TO TRADITIONAL KNOWLEDGE

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT-II

PROTECTION OF TRADITIONAL KNOWLEDGE

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-III

LEGAL FRAME WORK AND TK

A. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, The Protection of Plant Varieties and Farmers' Rights Act, 2001 (PPVFR Act).

B. The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT-IV

TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT-V

TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139.

Text Books:

1. 'Traditional Knowledge System in India' by Amit Jha, 2009.

Reference Books:

1. 'Traditional Knowledge System and Technology in India' by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
2. 'Traditional Knowledge System in India' by Amit Jha Atlantic publishers, 2002.

3. ‘Knowledge Traditions and Practices of India’ by Kapil Kapoor and Michel.
Web References:
1. www.youtube.com/watch?v=LZP1StpYEPM
2. https://nptel.ac.in/courses/121106003

POWER ELECTRONICS & DRIVES LABORATORY (PEL (P))

VI Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
EE314	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand I-V characteristics of SCR, MOSFET, IGBT and their gate driver circuits

CO2: Apply phase angle control for 1-Φ half and fully controlled bridge converters, 1-ϕ dual converter, 1-ϕ cycloconverter and 1-ϕ, 3-ϕ AC voltage controller to control output voltage of drives

CO3: Apply duty ratio control for choppers and inverters to control output voltage

CO4: Understand control signals generation using digital controllers for a drive

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. Steady state characteristics of SCR, IGBT and MOSFET
2. Single phase fully controlled bridge converter
3. Single phase semi controlled bridge converter
4. Single phase dual converter
5. Single-phase mid-point cycloconverter
6. Single-phase AC voltage controller
7. Three-phase AC voltage controller
8. Single phase full bridge PWM inverter
9. Forced commutated step down chopper
10. Step up chopper
11. R, RC and digital triggering methods for SCR
12. Static Kramer Drive
13. 3-phase fully controlled rectifier / chopper fed DC motor drive
14. V/f control of induction motor using dSPACE 1104 kit.
15. Simulation of power electronic converters (Rectifiers, Choppers, Inverters) using MATLAB

POWER SYSTEMS LABORATORY (PSP (P))

VI Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
EE315	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Analyze the characteristics of different types of electromagnetic and numeric relays.

CO2: Analyze the power system network for different conditions and Ferranti effects on long transmission

CO3: Analyze the sequence impedances of synchronous machines and transformers.

CO4: To study the fault analysis of an unloaded alternator.

CO5: Apply modern Engineering tool ETAP for solving Power System problems.

List of Experiments:

Note : At least 8 of the following experiments shall be conducted

1. IDMT Over Current Relay.
2. Micro processor based IDMT Over current relay.
3. Directional IDMT Over Current relay.
4. Micro Processor Based Directional Over current Relay.
5. Inverse Time Over Current Relay.
6. 220 kV-180km EHV-AC Long Transmission Line Simulator (Voltage regulation and determination of surge Impedance).
7. Fault analysis of a 3-phase unloaded alternator.
8. Determination of +ve, -ve and zero sequence impedances of 3-phase alternator.
9. (a) Load flow analysis using ETAP.
   (b) Short circuit analysis using ETAP.
10. (a) Harmonic Analysis using ETAP.
    (b) Determination of Transient Stability (Equal Area Criterion and Swing Equation) using ETAP.
11. Optimal Power flow using ETAP.
12. Determination of +ve, -ve and zero sequence impedances of 3-phase Transformer.
13. Determination of earth resistance.
14. Determination of dielectric strength of transformer oil.
15. Determination of capacitances of string insulator.

MICROCONTROLLERS LABORATORY (MC (P))

VI Semester :EEE				Scheme : 2020			
Course Code	Hours/Week			Credits	Maximum Marks		
EE316	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	3	1.5	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand configuration of GPIO and serial ports of MSP 430.

CO2: Understand the configuration of sensors and motors with MSP 430.

CO3: Understand interfacing of sensors and motors with Arduino.

List of Experiments

Note : At least 8 of the following experiments shall be conducted

1. a. Configure the GPIO ports of MSP430 to blink RED LED with a delay.
   b. Configure the GPIO ports of MSP430 to blink GREEN LED with a delay.
   c. Configure the GPIO ports of MSP430 to blink GREEN and RED LEDs, together and alternately.
2. a. Configure the GPIO ports of MSP430 to turn the RED LED ON when the push button is pressed and turn RED LED OFF when it is released.
   b. Configure the GPIO ports of MSP430 to turn the GREEN LED ON when the push button is pressed and turn GREEN LED OFF when it is released.
   c. Configure the GPIO ports of MSP430 to turn the RED LED ON When the push button is pressed and turn GREEN LED ON when the button is released.
3. a. Configure the GPIO ports of MSP430 to turn on ALL the LEDs once and then one by one with a delay.
   b. Configure the GPIO ports of MSP430 to turn on the LEDs to display a hexadecimal number equivalent values from 00 to FF.
4. Configure the GPIO ports of MSP430 for driving a DC Motor in forward and reverse direction.
5. Display the output of temperature and humidity sensor on serial monitor using Arduino.
6. Display the output of PIR sensor on serial monitor using Arduino.
7. Display the output of Ultrasonic sensor on serial monitor using Arduino.
8. Turn on an array of LEDs one by one, from left to right and then from right to left using Arduino.
9. Blinking of array of LED's equivalent to hexadecimal number ranging from 00 to FF using Arduino.
10. Interfacing IR sensor with Arduino and display the sensor output on serial monitor
11. Interfacing 16X2 LCD with Arduino and display the given input string.
12. Interfacing soil moisture sensor with Arduino and display the sensor output on a serial monitor.
13. Configure the GPIO ports of MSP430 for driving a Stepper Motor in forward and reverse direction.
14. Configure the GPIO ports of MSP430 for the generation of PWM pulses.
15. A program to drive DC motor in forward and reverse direction using Arduino.

HYBRID POWER SYSTEMS (HPS)

VI Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
SCEE03	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	4	2	40	60	100
End Exam Duration: 3 Hrs							

Course Outcomes : At the end of the course students will be able to

CO1: Understand the characteristics of PV module and arrays

CO2: Simulation and experimental study on solar PV systems.

CO3: Simulation and experimental study on wind turbine systems.

CO4: Simulation and experimental study on hybrid power systems (Microgrid).

CO5: Study on fault diagnosis, energy management and tariff system using PLC and SCADA

List of Experiments

1.	Study of Solar Radiation by using Pyranometer.
2.	V-I and P-V characteristics of PV cell, module and array (Simulation and Experimental).
3.	Simulation and experimental study of V-I and P-V characteristics of series and parallel arrays.
4.	Simulation of V-I and P-V characteristics of with different series and parallel combination arrays.
5.	Experimental of V-I and P-V characteristics of with different series and parallel combination arrays.
6.	MPPT technique on PV array.
7.	Different shading patterns with different combination of PV modules
8.	Different shading patterns with MPPT on PV array.
9.	Experimental study on solar tracking system and comparison of power extraction with and without module tracking
10.	Simulation of solar PV system
11.	Simulation of wind turbine system
12.	Simulation of solar PV and wind turbine combination system
13.	Simulation of solar PV, wind turbine and battery combination system (stand alone microgrid)
14.	Practical study on PV system using PLC and SCADA
15.	Practical study on wind turbine system using PLC and SCADA
16.	Practical study on hybrid power system using PLC and SCADA
17.	Study of various instruments used in (hybrid power systems) stand alone microgrid system
18.	Study on auto changeover of solar, wind and battery sources with PLC and SCADA.
19.	Fault diagnosis of hybrid power system using SCADA
20.	Study on energy conservation and tariff system of hybrid power system with different combinations of power sources using SCADA

UNIVERSAL HUMAN VALUES - 2 (UHV2)

<table>
<tr><td colspan="5">VII Semester : EEE</td><td colspan="4">Scheme : 2020</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">***</td><td rowspan="2">Mandatory Credit Course</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 1 ½ Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.</td></tr>
<tr><td colspan="9">CO2: Understand the harmony in the human being, family, society and nature/existence</td></tr>
<tr><td colspan="9">CO3: Strengthen of self-reflection.</td></tr>
<tr><td colspan="9">CO4: Develop a commitment and courage towards implementing Human values</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="2">Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</td><td colspan="7">Purpose and motivation for the course, recapitulation from Universal Human Values. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking</td></tr>
<tr><td colspan="9">UNIT - II</td></tr>
<tr><td colspan="2">Understanding Harmony in the Human Being - Harmony in Myself</td><td colspan="7">Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer). Understanding the characteristics and activities of ‘I’ and harmony in ‘I’. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="2">Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</td><td colspan="7">Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life</td></tr>
</table>

	examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives
UNIT - IV	
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence	Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all- pervasive space. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
UNIT - V	
Implications of the above Holistic Understanding of Harmony on Professional Ethics	Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics. **a**. Ability to utilize the professional competence for augmenting universal human order. **b**. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems. **c**. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: **a.** At the level of individual: as socially and ecologically responsible engineers, technologists and managers **b**. At the level of society: as mutually enriching institutions and organizations. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"

APPLICATIONS OF IOT (AIOT (P))

VII Semester : EEE					Scheme : 2020		
Course Code	Hours/Week			Credits	Maximum Marks		
SCEE04	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
	0	0	4	2	40	60	100

End Exam Duration: 3 Hrs

Course Outcomes : At the end of the course students will be able to

CO1: Understand interfacing of sensors and motors with NodeMCU.

CO2: Understand interfacing of sensors and motors with ESP32.

CO3: Understand interfacing of sensors and motors with Raspberry PI.

List of Experiments

1. To interface Ultrasonic sensor with NodeMCU and display the sensor output.
2. To interface temperature and humidity sensor with NodeMCU and display the sensor output.
3. To interface PIR sensor with NodeMCU and display the sensor output.
4. To interface IR sensor with NodeMCU and display the sensor output.
5. To interface Array of LEDs with NodeMCU and
   a) turn on ALL LEDs once
   b) turn on LEDs one by one from left to right and then from right to left.
6. To interface an Array of LEDs with NodeMCU and turn on LEDs to display a hexadecimal number equivalent value from 00 to FF.
7. Interfacing DC motor with NodeMCU.
8. To interface Ultrasonic sensor with ESP32 and display the sensor output.
9. To interface temperature and humidity sensor to ESP32 and display the sensor output.
10. To interface PIR sensor with ESP32 and display the sensor output.
11. To interface IR sensor with ESP32 and display the sensor output.
12. To interface an Array of LEDs with ESP32 and
    a) turn on the ALL LEDs once
    b) turn on LEDs one by one from left to right and then from right to left.
13. To interface an Array of LEDs with ESP32 and turn on LEDs to display a hexadecimal number equivalent value from 00 to FF.
14. To interface DC motor with ESP32.
15. To interface Ultrasonic sensor with Raspberry PI and display the sensor output.
16. To interface temperature and humidity sensor with Raspberry PI and display the sensor output.
17. To interface PIR sensor with Raspberry PI and display the sensor output.
18. To interface IR sensor with Raspberry PI and display the sensor output.
19. To interface an Array of LEDs with Raspberry PI and
    a) turn on the ALL LEDs once
    b) turn on LEDs one by one from left to right and then from right to left.
20. To interface an Array of LEDs with Raspberry PI and turn on the LEDs to display a hexadecimal number equivalent value.

Professional Elective – I

EE303	Network Theory and Signals & Systems
EE304	Communication Systems
EE305	Digital Control Systems

Professional Elective – II

EE31	Non-Conventional Sources of Energy
EE312	Electrical Distribution Systems
EE313	Digital Design with FPGA

Professional Elective – III

EE401	Power System Operation and Control
EE402	Power Quality and FACTS
EE403	Control Systems Design

Professional Elective-IV

EE404	Elements of Digital Signal Processing
EE405	Electrical and Hybrid Vehicles
EE406	Special Machine & Control

Professional Elective-V

EE407	Utilization of Electrical Power
EE408	Electrical Energy Conservation and Auditing
EE409	Electrical Estimation & Costing

NETWORK THEORY & SIGNALS AND SYSTEMS (NT&SS)

V Semester :EEE					Scheme : 2020			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EE303	**Professional Elective - I**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand different network realization for the given transfer function

CO2: Understand the concepts of signals, systems their properties and Fourier series of periodic signals.

CO3: Apply Fourier transform to continuous time signals and systems

CO4: Apply Laplace transform to continuous time signals and systems.

CO5: Apply Z-Transform to Discrete time signals and systems.

UNIT - I	
Elements of Network Synthesis:	Poles & Zeros of network function, Significance of poles and zeros, Elements of realisability, Synthesis of one port RL, RC and LC networks using, Foster and Cauer forms.
UNIT - II	
Introduction to signals and systems	Basic continuous and discrete time signals, systems and their properties, classification of signals, analogy between vector and signal, orthogonality, Dirichlet's conditions, trigonometric and exponential Fourier series.
UNIT - III	
Fourier Transforms	Fourier Transforms and properties, Fourier Transform of periodic signals, Parseval's theorem, Fourier transform of some common signals, system analysis with Fourier transform, sampling theorem (Elementary concept only)
UNIT - IV	
Laplace Transforms and Applications	Introduction, Properties, Laplace transform of some common signals, Laplace transform of periodic signals, Inverse Laplace transform, circuit analysis using Laplace transforms, Response of RL, RC, RLC Networks to Step, Ramp and impulse functions.
UNIT - V	
Z - Transforms	Introduction, Distinction between Laplace, Fourier and Z-Transforms, Region of convergence in Z-Transforms, properties of ROC, properties of Z-Transforms, Z-transform of some common signals, Inverse Z-Transform.

Text Books :

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997
2. Abhijit Chakrabarti , " Circuit Theory (Analysis and Synthesis)", Dhanpat Rai Publishing Co Pvt Ltd
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. P. Ramesh Babu and R. Ananda Natarajan, "Signals and Systems", Scitech publications, Fourth Edition, 2011.
5. A. Anand Kumar, "Signals and Systems" PHI publications, 2012

Reference Books :

1. Sivanaga Raju, G. Kishor and C. Srinivasa Rao , "*Electrical Circuit Analysis*", 2010.Thomson Press (India) Ltd.
2. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007
3. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

Web References:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-011-introduction-to-

communication-control-and-signal-processing-spring-2010/readings/MIT6_011S10_notes.pdf
2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
3. https://nptel.ac.in/courses/108/106/108106163/
4. http://www.bput.ac.in/lecture-notes-download.php?file=lecture_note_222311150215010.pdf.
5. https://lecturenotes.in/subject/36/signals-and-systems-ss.
6. https://nptel.ac.in/courses/108/105/108105065/
Question Paper Pattern:
Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section. **End Exam:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

COMMUNICATION SYSTEMS (CS)

V Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EE304	**Professional Elective - I**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand amplitude modulation and demodulation schemes.

CO2: Understand modulation and demodulation techniques for angle modulation.

CO3: Understand the principles of various pulse modulation and demodulation schemes.

CO4: Understand various digital modulation techniques.

CO5: Understand spread spectrum modulation and various multiple access techniques.

UNIT – I	
Amplitude Modulation	Block diagram of general communication system, Need for Modulation, Generation and demodulation of AM, Band width, Power relations, Generation and demodulation of DSB-SC, Single Side Band Suppressed Carrier Modulation (theory only), Vestigial side band modulation (theory only), Comparison of various AM systems. Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM).
UNIT – II	
Angle Modulation	Frequency Modulation and Phase Modulation, FM narrow band and wide band techniques, Band width, Generation of FM- Direct and indirect FM, Demodulation of FM using phase discrimination method.
UNIT – III	
Pulse Modulation Techniques	Sampling theorem, introduction of PAM, PWM, and PPM, elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta Modulation, Adaptive Delta Modulation (Theory only).
UNIT – IV	
Digital Modulation Techniques	Elements of digital communication systems, advantages of digital communication systems, brief discussion on Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), & Phase Shift Keying (PSK).
UNIT – V	
Spread Spectrum Modulation	Introduction, Pseudo-noise sequence, DS spread spectrum with coherent binary PSK, Processing gain, FH spread spectrum.
Multiple Access Techniques	Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA) & Code Division Multiple Access (CDMA).

Text Books

1. Simon Haykin, "Communication Systems", 2nd Edition, Wiley Eastern, 2008
2. K. Sam Shanmugam, "Digital and Analog Communication Systems", 2nd Edition, Wiley-India,2008
3. T. S. Rappaport, "Wireless Communications", 2nd Edition, Prentice Hall of India, 2012.

Reference Books

1. Kennedy.G., "Electronic Communication Systems", 5th edition. Mc-Graw Hill, 2014.
2. Taub, H and D.Schilling, "Principles of Communication Systems", 3rd edition, Tata McGraw Hill, 2013.
3. A.Bruce Carlson, "Communication Systems", 5th edition, McGraw Hill International, 2012.
4. Simon Haykin, "Digital Communication", 2nd Edition, Wiley Eastern, 2006.

Web References:

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://onlinecourses.nptel.ac.in/noc19_ee46/preview

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

DIGITAL CONTROL SYSTEMS (DCS)

V Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE305	Professional Elective - I	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand discrete representation of LTI systems and basics of Z- Transforms.

CO2: Understand state space representation of discrete time systems.

CO3: Analyze stability of open loop and closed loop discrete-time systems.

CO4: Design and analyze digital controllers and dead beat response.

CO5: Design of pole placement and state observers

UNIT – I	
Introduction to Digital Control Systems	Basics of Digital Control Systems, Discrete representation of continuous systems, sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization, Choice of sampling frequency, ZOH equivalent.
Z-Transforms	Z-Transform and Inverse Z Transform for analyzing discrete time systems, pulse transfer function, pulse transfer function of closed loop systems. Mapping from s-plane to z plane, Time response of discrete time system. steady state error analysis of digital control systems.
UNIT - II	
State Space Analysis	State space modeling of digital systems with sample and hold - state transition equation of digital time in variant systems - solution of time in variant discrete state equation by the Z- transformation - transfer function from the state model.
Jordan Canonical form:	Eigen values, Eigen vectors and diagonalisation of the A-matrix, Jordan canonical form, computation of state transition matrix.
UNIT – III	
Stability	Definition of stability, stability tests, Stability analysis using bilinear transformation. Stability analysis by Jury test, Liapunov stability analysis, the second method of Liapunov. Root loci for digital control systems.
UNIT - IV	
Design of PID Controller, Dead Beat Response	Design of Discrete PID Controller, Design of digital control system with dead beat response. Practical issues with dead beat response design. Design of sampled-data control systems with dead beat response.
UNIT - V	
Pole placement and observer Design	Introduction, controllability, observability, useful transformations in state space analysis and design, pole placement through state feedback. Design via poleplcement, State Observers, necessary and sufficient condition for state observation, full order state observer.

Text Books

1. K. Ogata, “Discrete-time Control systems”, 2nd Edition P, Englewood Cliffs, 1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.

Reference Books

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, 3 rd

Edition Addison-Wesley, 1998.

2. B.C. Kuo, “Digital Control System”, 2nd Edition Holt, Rinehart and Winston, 1995

Web References:

1. https://nptel.ac.in/courses/108/103/108103008/

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

NON - CONVENTIONAL SOURCES OF ENERGY (NCSE)

VI Semester: B.Tech						Scheme: 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE311	Professional Elective - II	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	0	0	3	40	60	100
Sessional Exam Duration: 1 ½ Hrs					End Exam Duration: 3 Hrs			

Course Outcomes: At the end of the course the student will be able to

CO1: Understand need and significance of solar energy.

CO2: Understand the basic principle of wind energy generation and aerodynamics.

CO3: Understand the power generation from wave and tides.

CO4: Understand the concept of biomass, geothermal energy and its utilization.

CO5: Understand the concept of direct energy conservation from various resources.

UNIT I

Solar Energy:

Solar radiation, measurements of solar radiation, flat plate and concentrating collectors, solar direct thermal applications, solar thermal power generation, fundamentals of solar photo voltaic conversion, solar cells, solar PV power generation, solar PV applications.

UNIT II

Wind Energy:

Introduction to wind energy, factors influencing wind and wind energy estimation, variation of wind speed with height and time, wind energy conversion principles, components of wind energy conversion systems, (WECS), classification of WECS, wind turbine aerodynamics.

UNIT – III

Ocean Energy:

Introduction, principle of ocean thermal energy conversion (OTEC), OTEC plants. Tidal power generation, tidal energy technologies, energy from waves, wave energy conversion, wave energy technologies, advantages and disadvantages.

UNIT – IV

Bio Mass:

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

Geothermal Energy:

Geothermal energy resources, types of wells, methods of harnessing the energy, scope in India.

UNIT – V

Direct Energy Conversion:

Principles of energy conservation, energy conversion chart with various source of energy, direct energy conversion (DEC) devices, applications, advantages and disadvantages of DEC.

Text Books:

1. G.D. Rai, “Non-Conventional Energy Sources”, Kanna publications, 6th edition 2011.
2. R.Ramesh Kumar, K.Uday Kumar, M.Ananda Krishnan “Renewable Energy Sources”, Narosa publishing house 1997.
3. John Twidell, Tony Weir, “Renewable Energy Resources” 3rd edition Taylor & Francis.
4. Ashok V Desai, “Non-Conventional Energy”, 2003, New Age Publications.
5. D.P.Kothari, K.C.Singal and Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, 2nd edition, PHI Learning private limited, New Delhi.
6. B.H. Khan “Non-Conventional Energy Resources”, Tata McGraw Hill Pub., 2009.
7. S.L.Soo, “Direct energy Conversion” Prentice Hall, 1968.

Reference Books :

1. G. N Tiwari, M.K Ghosal, "Renewable energy resources – Basic Principles and Applications", 2004 Narosa Publications.
2. K.M Mital, "Non-Conventional Energy Systems", 1999, AH Wheeler publishing Co. Ltd.
3. S.P Sukhatme, J.K Nayak "Solar Energy" 4th edition 2008 Tata McGraw Hill.

Web Resources:

1. https://en.wikipedia.org/wiki/Solar_irradiance
2. http://sfera.sollab.eu/downloads/Schools/Eduardo_Zarza_Basic_concepts.pdf
3. https://en.wikipedia.org/wiki/Solar_energy
4. https://en.wikipedia.org/wiki/Solar_energy
5. https://solarprofessional.com/articles/design-installation/solar-energy-storage
6. https://www.energy.gov/science-innovation/energy-sources/renewable-energy/wind
7. https://www.eia.gov/energyexplained/?page=biomass_home
8. https://en.wikipedia.org/wiki/Geothermal_energy
9. https://www.renewableenergyworld.com/ocean-energy/tech.html
10. http://www.mhdenergy.com/

Question Paper Pattern:

Internal Assessment:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

ELECTRICAL DISTRIBUTION SYSTEMS (EDS)

VI Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
EE312	**Professional Elective - II**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the load classification and their characteristics.

CO2: Understand the design of distribution feeders and substations.

CO3: Analyze the power loss and voltage loss for uniform and non uniform loads.

CO4: Understand the distribution system protective devices and coordination.

CO5: Apply the concepts of power factor improvement and voltage control in distribution systems.

UNIT – I	
General Concepts	Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor, Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.
UNIT - II	
Distribution Feeders	Design Considerations of Distribution Feeders: Radial and loop types of Primary feeders, voltage levels, feeder loading.
Substations	Location of Substations: Rating of distribution substation, service area within Primary feeders. Benefits derived through optimal location of substations.
UNIT – III	
System Analysis	Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.
UNIT - IV	
Protection	Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers.
Coordination	Coordination of Protective Devices: General coordination procedure.
UNIT - V	
Compensation For Power Factor Improvement	Capacitive compensation for power-factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation – Economic justification - Procedure to determine the best capacitor location.
Voltage Control	Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

Text Books

1. Turan Gonen, “Electric Power Distribution system, Engineering”, Mc Graw-hill Book Company, 1985.
2. A.S. Pabla , “Electric Power Distribution”, Tata Mc Graw-hill Publishing company, 4th edition. 1997.
3. Anthony J Pansini, “ Electrical Distribution Engineering ”, The Fairmont Press, INC, 2007.

Reference Books

1. S. Sivanagaraju, V.Sankar, “Electrical Power Distribution and Automation”, Dhanpat Rai & Co. 2006.
2. V. Kamaraju, “Electrical Power Distribution Systems”, Right Publishers, 2009.
3. S. Sivanagaraju, S. Satyanarayana , Electric Power Transmission and Distribution, 1st edition,

Pearson Education India, New Delhi,2008.

Web References:

1. http://gvpcew.ac.in/Material/EEE/4%20EEE%20-%20eds%20unit%201.pdf
2. http://pages.mtu.edu/~avsergue/EET3390/Lectures/CHAPTER6.pdf
3. https://www.slideshare.net/srtu99ler/chapter-iv-426students
4. https://www.eng.uwo.ca/people/tsidhu/Documents/ES586B-Hesam%20Hosseinzadeh-250441131.pdf
5. https://www.slideshare.net/tbmeng/power-factor-improvement-45696305

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

DIGITAL DESIGN WITH FPGA (DDFPGA)

VI Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE313	Professional Elective - II	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basics of the hardware description language, verilog.

CO2: Understand combinational and sequential modeling in verilog.

CO3: Understand the basics of FPGA and its programming technology.

CO4: Understand the logic circuit representation of FPGA.

CO5: Understand the FPGA Structure.

UNIT – I	
VERILOG Basics-I	Detailed Digital Design Flow, Characterizing Hardware Languages, Verilog HDL,RTL Level Design, Logic Synthesis Process, Elements of Verilog, Component Description in Verilog, Test bench basics, Module Basics, Verilog Simulation Model.
UNIT – II	
VERILOG Basics-II	Basic Compiler Directives, some useful System Tasks, Hierarchical Structures, Assign Statements, Behavioural Combinational Description examples, Sequential Model examples.
UNIT – III	
FPGA Basics-I	History of FPGAs, Position of FPGA, Components of an FPGA, Programming Technology: Flash Memory, Anti-fuse Technology, Static Memory Technology, Summary of Programming Technology.
UNIT – IV	
FPGA Basics-II	Logic Circuit Representation of FPGA: Circuit Implementation on FPGA, Logical Expression by Product Term, Logical Expression by Lookup Table, Structure of Lookup Table, Logical Expression by other Methods.
UNIT – V	
FPGA Structure	Logic Block, Logic Cluster, Adaptive LUT Routing, Switch Block, Connection Block,I/O Block,DSP Block, Hard Macros, Embedded Memory, Configuration Chain, PLL and DLL.

Text Books

1. Zainalabedin Navabi, ―Verilog Digital System Design‖, McGraw-Hill Professional, 2005.
2. Hideharu Amano, ― Principles and Structures of FPGAs‖ Springer, Singapore, 2018.

Reference Books

1. Samir Palnitka, ―Verilog® HDL: A Guide to Digital Design and Synthesis‖, Second Edition (2nd ed.). Prentice Hall Press, Upper Saddle River, NJ, USA, 2003
2. Pak K Chan & Samiha Mourad, ―Digital design using field programmable gate arrays‖. PTR Prentice Hall, Englewood Cliffs, N.J., 1994.
3. Ian Grout, ―Digital Systems Design with FPGAs and CPLDs‖, Newnes, Newton, MA, USA,

Web References:

1. https://nptel.ac.in/courses/117108040/
2. https://nptel.ac.in/courses/108105113/45

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

POWER SYSTEM OPERATION AND CONTROL (PSOC)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE401	Professional Elective - III	3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the economic aspects of power system.

CO2: Develop mathematical models for turbine, generator and governing mechanisms

CO3: Analyze load frequency control of single area and two-area systems

CO4: Understand the basic principles of power system economics.

CO5: Understand the concepts of Smart Grids.

UNIT – I	
Economic Operation of Power Systems	Optimal operation of Generators in Thermal Power Stations, Heat rate Curve, Cost Curve, Incremental fuel and Production Costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation considering transmission line losses, Loss Coefficients, General transmission line loss formula.
UNIT - II	
Load Frequency Control	Necessity of keeping frequency constant, Automatic Voltage and frequency control. Basic concepts of governing mechanism: speed governing system model, turbine model, generator and load model, Numerical problems.
UNIT – III	
Single Area Load Frequency Control	Analysis of Load Frequency Control of an Isolated Power System, Steady state analysis and dynamic response of Controlled and Uncontrolled case, Integral Control of Single area system
Two-Area Load Frequency Control	Load frequency control of two-area system, uncontrolled case and controlled case, tie-line bias control.
UNIT - IV	
Power System Economics and Management	Basic pricing principles: Generator cost curves, Utility functions, Power exchanges, spot pricing. Electricity market model (vertically integrated, purchasing agency, Whole sale competition, Retail competition), Demand side management, Transmission and distribution charges, Ancillary Services, Regulatory framework.
UNIT - V	
Introduction to Smart Grid Solutions	Advanced Metering Infrastructure, Demand Response, Distributed generation. Home Area Network, Communication, Cyber Security, Electric Vehicles, Electric Energy Storages (EES).

Text Books

1. C.L. Wadhwa , "Electrical Power Systems", New Age International (P) Ltd. 2006.
2. L.P. Singh , " Advanced Power System Analysis and Dynamics", New Age International (P) Ltd. 2006.
3. I.J.Nagrath & D.P.Kothari, "Modern Power system Analysis", Tata McGraw-Hill Publishing

company, 3rd edition,2003.
4. A.S. Pabla, “Electric Power Distribution”, Tata Mc Graw-hill Publishing company, 4th edition.1997.

Reference Books :

1. Hadi Saadat , “Power System Analysis”, TMH Edition. 2009.
2. Grainger and Stevenson , “Power System Analysis”, Tata McGraw Hill. 2008
3. A.R.Bergen , “Power System Analysis”, 2nd edition, Prentice Hall, Inc. 2001.
4. Turan Gonen, “Electric Power Distribution system, Engineering”, Mc Graw-hill Book Company,1985.

Web References:

1. https://www.slideshare.net/BalaramDas3/economic-operation-of-power-system
2. https://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/chapter_5/5_7.html
3. https://www.slideshare.net/manash234/load-frequency-control-of-two-area-system
4. https://nptel.ac.in/courses/108101005/6
5. https://www.smartgrid.gov/files/sg_introduction.pdf

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

POWER QUALITY AND FACTS (PQ & FACTS))

VII Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
EE402	**Professional Elective - III**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : $1\frac{1}{2}$ **Hrs**						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of power quality and its issues.

CO2: Understand the short and long interruptions.

CO3: Understand the importance of controllable parameters, role of FACTS controllers in AC System.

CO4: Understand the significance of shunt and series compensation for the improvement of System stability.

CO5: Understand the role and importance of combined compensation for the improvement of system stability.

UNIT - I	
Introduction	Introduction to Power Quality (PQ) problem, Terms used in PQ: Voltage sag, Voltage swell, Surges, Harmonics, Over voltages, Spikes, Voltage fluctuations, Transients, Interruption, Overview of power quality phenomenon - Remedies to improve power quality.
UNIT - II	
Long Interruptions	Interruptions-Definitions, Difference between failure, outage, interruptions, Causes of long interruptions, origin of interruptions, limits for the interruptions frequency, limits for the interruption duration.
Short Interruptions	Origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions.
UNIT - III	
Introduction to FACTS	Transmission interconnections, power flow in an AC system, loading capability limits, power flow and dynamic stability considerations, importance of controllable parameters. Basic types of FACTS controllers, benefits from FACTS controllers.
UNIT - IV	
Static Shunt Compensators	Objectives of shunt compensation, midpoint voltage regulation for line segmentation, end of line voltage support to prevent voltage instability, Methods of controllable VAR generation.
Static Series Compensation	Objectives of series compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, sub synchronous oscillation damping.
UNIT - V	
Combined Compensation	GTO thyristor controlled series capacitor (GSC), Thyrislor Switched Series Capacitor (TSSC) and Thyristor Controlled Aeries Capacitor(TCSC), control schemes for GSC, TSSC and TCSC. Introduction to UPFC and IPFC and their role in power system operation.

Text Books :

1. Math H J Bollen, "Understanding Power Quality Problems", IEEE Press, 1999
2. R C Dugan, M.F,M Granghar, H.W.Beaty," Electrical power quality" ,TMH. 1993
3. G. T. Heydt, "Electric Power Quality", Stars in a Circle Publications, 1991.
4. Hingorani , "Understanding Facts Concepts", IEEE Publications 2000

Reference Books :

1. Arindam Ghosh and Gerard Ledwich,"Power Quality Enhancement using custom power devices"-Kulwer academicpublishers. 2002
2. C.Sankaran ,"Power quality", CRC Press 2002.
3. Eswald F.Fudis and M.A.S.Masoum ,"Power Quality in Power System and Electrical Machines", Elseviar Academic Press , 2013.
4. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P)Ltd. 2007.
5. Vijay K. Sood," HVDC and FACTS Controllers" , Springer Science & Business Media, 2006.

Web References:

1.https://www.bharathuniv.ac.in/colleges1/downloads/courseware_eee/Notes/CE3/BEE044%20PQ.pdf
2. http://electrical-engineering-portal.com/9-most-common-power-quality-problems
3. http://onlinelibrary.wiley.com/book/10.1002/9781118922064
4. https://www.slideshare.net/mayurdhande11/voltage-sag-and-its-mitigation-54121698
5. https://www.slideshare.net/DheerajSuri/pq4-fundamentals-of-harmonics
6. https://www.electronicshub.org/high-voltage-dc-transmission-system/
7. https://www.slideshare.net/maheshbabu252/hvdc-notes
8. https://www.scribd.com/doc/106817743/Converter-Faults-Protection
9. https://www.slideshare.net/ayyarao/basic-types-of-facts-controllers
10. https://en.wikipedia.org/wiki/Flexible_AC_transmission_system

Internal Assessment:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

CONTROL SYSTEMS DESIGN (CSD)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE403	Professional Elective - III	3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic fundamental control system design specifications.

CO2: Understand the importance of observability and controllability for system design.

CO3: Design modern controllers based on the state space techniques, optimal control and robust control techniques.

CO4: Understand the concepts of stability and optimal control.

CO5: Understand the basic compensator design specifications.

UNIT – I	
Design of Feedback Control Systems	Introduction; Approaches to System Design; Cascade Compensation Networks; Phase-Lead Design Using the Bode Diagram; Phase-Lead Design Using the Root Locus; System Design Using Integration Networks; Phase-Lag Design Using the Root Locus; Phase-Lag , phase lead Design Using the Bode Diagram; Design on the Bode Diagram Using Analytical Methods; Systems with a Pre-filter; Design for Deadbeat Response; Design Examples.
UNIT - II	
Design of State Variable Feedback Systems	Introduction, State space representation of physical systems, State space models of some common systems like R-L-C networks, DC motor, inverted pendulum etc., Controllable Canonical Form, Observable Canonical Form, Diagonal Canonical Form, State transition matrix, Solution of state equations, Controllability and Observability, Full-State Feedback Control Design; Observer Design; Integrated Full-State Feedback and Observer; Tracking Reference Inputs; Internal Model Design; Design Examples.
UNIT – III	
Introduction to Robust Control and optimal control	Robust control system and system sensitivities to parameter perturbations, analysis of robustness, systems with uncertain parameters, considerations in design of robust control system, robust PID controller.
UNIT - IV	
Lyapunov's stability and optimal control	Positive/negative definite, positive/negative semi-definite functions, Lyapunav stability criteria, introduction to optimal control, Riccatti Equation, Linear Quadratic Regulator, Design Examples.
UNIT - V	
Introduction to Compensator	Derivative and integral error compensation, Analysis of the basic approaches to compensation, cascade compensation, feedback compensation Compensator Design using Root-locus: Improving steady-state error and transient response by feedback compensation, cascade compensation, integral, derivative compensation, Lag, Lead, Lag-Lead compensation.

Text Books

1. K. Ogata, Modern Control Engineering, Prentice Hall of India, 4th edition, 2002
2. M. Gopal, Control Systems Principles and Design, TMH, New Delhi, 2nd edition,2002
3. B.S. Monke, "Control System Design", Khanna Publishers, 1st Edition,2005

Reference Books

1. B C Kuo ,"Automatic Control Systems" , Prentice Hall of India.
2. K. Ogata ,Discrete Time Control Systems , Prentice Hall of India

Web References:

1. http://nptel.ac.in/courses/108103007/16
2. https://en.wikipedia.org/wiki/State-space_representation
3. http://ctms.engin.umich.edu/CTMS/index.php?example=Introduction&section=ControlStateSpace

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELEMENTS OF DIGITAL SIGNAL PROCESSING (EDSP)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
EE404	Professional Elective - IV	3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the classification of discrete time systems, Linear constant coefficient difference equation and discrete time Fourier transform.

CO2: Apply Discrete Fourier and Fast Fourier transform techniques to digital signals.

CO3: Understand the designing of IIR &FIR digital filters.

CO4: Understand the realization of IIR and FIR digital filters.

CO5: Understand the internal architecture, addressing modes of TMS320C67XX digital signal Processor

UNIT – I

Introduction to Digital Signal Processing	Discrete time signals & sequences, Static & dynamic systems, linear shift invariant systems, stability and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Discrete Time Fourier Transforms (DTFT).
Discrete Fourier Transform	Discrete Fourier Transform (DFT), Properties of DFT, Computation of DFT, linear convolution of sequences using DFT.

UNIT - II

Fast Fourier Transform	Fast Fourier transform (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, comparison of DFT and FFT computations.

UNIT – III

IIR Digital Filters	Analog filter approximations – Design of Butter worth and Chebyshev filters. Analog to Digital transformations - Design of IIR Digital filters from analog filters.
FIR Digital Filters	Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Comparison of IIR & FIR filters.

UNIT - IV

Realization of Digital Filters	Basic structures of IIR systems - Direct form I & II , Cascade, parallel forms. Basic structures of FIR systems.

UNIT - V

Architecture of TMS 320C67XX	Introduction to DSP processor, Internal architecture TMS320C67XX, addressing modes, On-Chip Peripherals.

Text Books :

1. John G. Proakis, Dimitris G. Manolakis , “Digital Signal Processing, Principles, Algorithms, and Applications”, Pearson Education / PHI. 2007.
2. A.V.Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, PHI.
3. . B.Venkataramani, M. Bhaskar , “Digital Signal Processors – Architecture, Programming and Applications”, TATA McGraw Hill. 2002.
4. Emmanuel C.Ifearchar, Barrie W.Jervis, “DSP A Practical Approach”, Pearson Ed.

Reference Books :

1. Andreas Antoniou, “Digital Signal Processing”, TATA McGraw Hill. 2006
2. Robert J. Schilling, Sandra L. Harris, “Fundamentals of Digital Signal Processing using

Matlab", Thomson,. 2007.

3 C. Britton Rorabaugh,"DSP Primer", Tata McGraw Hill, 2005.

Web References:

1. https://nptel.ac.in/courses/nptel_download.php?subjectid=117102060
2. https://lecturenotes.in/subject/44/digital-signal-processing-dsp
3. https://www.dspguide.com/ch28/1.htm

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ELECTRICAL AND HYBRID VEHICLES (EHV)

VII Semester : EEE					Scheme : 2020			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
EE405	**Professional Elective - IV**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 3 Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the need for Electrical Vehicle (EV), advantages and compare with conventional Vehicle

CO2: Understand the dynamics of EV and its characteristics

CO3: Understand the battery terminology and performance parameters

CO4: Understand transmission components and configurations of an electric drive train

CO5: Understand types of hybrid vehicles and their performance parameters

UNIT - I	
Introduction to Electric Vehicles	EV System -Recent EVs and HEVs - EV Advantages - Efficiency Comparison - Pollution Comparison - Capital and Operating Cost Comparison - EV Market.
UNIT - II	
Vehicle Mechanics	Roadway Fundamentals - Laws of Motion -Vehicle Kinetics-Dynamics of Vehicle Motion -Propulsion Power - Force-Velocity Characteristics- Maximum Gradability-Velocity and Acceleration -Constant F_{TR}, Level Road-Velocity Profile-Distance Traversed -Tractive Power - Energy Required –Non-constant F_{TR}, General Acceleration -Propulsion System Design –Problems.
UNIT - III	
Energy Source: Battery	Battery Basics - Lead-Acid Battery -Cell Discharge Operation - Cell Charge Operation-Construction-Battery Parameters - Battery Capacity-Discharge Rate - State of Charge- State of Discharge- Depth of Discharge-Technical Characteristics - Practical Capacity -Battery Energy -Constant Current Discharge -Specific Energy - Battery Power -Specific Power -Battery Pack Design - Ragone Plots - Targets and Properties of Batteries –Batteries for EV applications.
UNIT - IV	
Electric Vehicle Drive train	Electric Vehicle Drive train - EV Transmission Configurations - Transmission Components – Gears- Automobile Differential – Clutch- Brakes -Ideal Gearbox: Steady State Model -Gear Ratio (GR)- Torque-Speed Characteristics- EV Motor Sizing -Initial Acceleration - Rated Vehicle Velocity -Maximum Velocity-Maximum Gradability – Simple Problems.
UNIT - V	
Hybrid Electric Vehicles	Types of Hybrids-Series and Parallel HEVs -Advantages and Disadvantages- Series-Parallel Combination - Example IC Engines in HEVs- Gas Turbine Engine - Hybrid Drive trains-Sizing of Components - Rated Vehicle Velocity - Initial Acceleration-Maximum Velocity- Maximum Gradability-Simple Problems.

Text Books :

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles_ Fundamentals, Theory, and Design”, Second Edition, CRC Press
2. Ali Emadi, “Advanced-Electric-Drive-Vehicles” , CRC Press
3. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi, “Modern Electric, Hybrid Electric & Fuel Cell Vehicles”, CRC Press

Reference Books :

1. James Larminie, John Lowry," Electric-Vehicle-Technology-Explained", John Wiley & Sons Ltd,
2. Sheldon. S.Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles" Springer

Web References:

1. http://nptel.ac.in/courses/108103009/1
2. https://www.telegraph.co.uk/cars/advice/difference-hybrid-plug-in-hybrid-electric-ev-car/
3. https://nptel.ac.in/courses/108102121/

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

SPECIAL MACHINES AND CONTROL (SMC)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
EE406	Professional Elective - IV	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the performance of Switched Reluctance Motor (SRM).

CO2: Understand the performance of Servo Motors.

CO3: Understand the constructional features, performance characteristics and control techniques of Permanent magnet synchronous motors (PMSM).

CO4: Understand the performance of Brushless DC (BLDC) motors.

CO5: Understand the performance of stepper motor.

UNIT – I	
Switched Reluctance Motor and Control Techniques	Switched Reluctance Motor (SRM) constructional features, principle of operation. Torque equation, characteristics. Control techniques and drive – Concept, mathematical model and analysis. (Elementary treatment only).
UNIT - II	
Servomotors and Control Techniques	Servomotors, AC and DC servo motors, constructional features, and principle of operation, torque production. Performance characteristics, control techniques, applications and transfer function. (Elementary treatment only).
UNIT – III	
PMSM and Control schemes	Permanent magnet materials and motors, principle of operation, EMF and torque equation, and torque speed characteristics. Comparisons of conventional and PM synchronous motor, transfer function of PMSM and control schemes of PMSM. (Elementary treatment only).
UNIT - IV	
BLDC Motors and Control Schemes	Constructional features, principle of operation, Commutation in DC motors, difference between mechanical and electronic commutators, hall sensors, optical sensors. Types of BLDC motors, EMF and torque equation, torque-speed characteristics, drives - concept and control of BLDC motors (Elementary treatment only).
UNIT - V	
Stepper Motors and Control Schemes	Constructional features, Principle of operation, modes of excitation, torque production in Variable Reluctance (VR) stepping motor, dynamic characteristics. Drive system and circuit for open loop control and closed loop control. Applications of stepper motors. (Elementary treatment only).

Text Books

1. K. Venkataratnam "Special Electrical Machines" Universities Press (India) Private Limited, Hyderabad, First Edition reprinted in 2013. (Unit I & V)
2. E.G. Janardanan "Special Electrical Machines" PHI Learning Private Limited, Delhi First Edition reprinted in 2014. (Unit II, III and IV)

Reference Books

1. R.S. Krishnan, "Switched Reluctance Motor Drives: Modeling Simulation Analysis, Design and Application" CRC press 2001.
2. Miller, T.J.E. "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press,

Oxford, 1989
3. R.S.Krishnan “Permanent Magnet Synchronous Motor and Brushless DC Motor Drives” Rc press, 2002.
4. Naser A and Boldea I, “Linear Electric Motors: Theory, Design and Practical Application”, Prentice Hall Inc., New Jersey, 1987.
5. Kenjo. T, “Stepping Motor and their Microprocessor control”, Clarendon press Oxford, 1989.

Web References:

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://ocw.mit.edu/courses/6-685-electric-machines-fall-2013/pages/course-notes/
3. https://onlinecourses.nptel.ac.in/noc19_ee65/preview

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

UTILIZATION OF ELECRICAL POWER (UEP)

VII Semester : EEE						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
EE407	**Professional Elective - V**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the estimation of electric power and able to plot the power demand in the form of load curve

CO2: Understand the importance of power factor improvement.

CO3: Understand the concept, types and usage of electrical heating and welding.

CO4: Understand different types of lighting schemes. Design street lighting and flood lighting

CO5: Understand the principles of electric traction.

	UNIT - I
Economic aspects of power generation	Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems. Tariff Methods: Costs of generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods, Types of Depreciation and Numerical Problems.
	UNIT - II
Power factor improvement	Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems.
	UNIT – III
Electric Heating	Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.
Electric Welding	Electric welding, resistance welding and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.
	UNIT - IV
Illumination fundamentals	Basic principles of light control, Types of lighting schemes. Street Lighting: Objectives, Principles and types Flood Lighting: Purpose, Design of flood lighting scheme for Airports, Stadiums and Malls
	UNIT - V
Electric Traction	System of electric traction and track electrification. Mechanics of train movement. Speed-time curves for different services, trapezoidal and quadrilateral speed time curves Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

Text Books :

1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, “A Text Book on Power System Engineering”, Dhanpat Rai & Co Pvt. Ltd. 1999.
2. C.L. Wadhwa , “Generation, Distribution and Utilization of electrical Energy”, New Age a. International (P) Limited, Publishers. 1997
3. J.B.Gupta, “Utilisation of Electric Power & Electric Traction”, S.K. Kataria & Sons Publishers. 1997
4. Partab, “Art & Science of Utilization of electrical Energy”, 3 rd edition Dhanpat Rai & Sons.

2004
5. J.B.Gupta , “Utilisation of Electric Power & Electric Traction”, S.K. Kataria & Sons Publishers. 1997

Reference Books :

1. V.K Mehta and Rohit Mehta (2004), “Principles of Power Systems”, S.Chand & Company, New Delhi.
2. G.C. Garg, Utilization of Electric Power”, Khanna Publishers. 2008

Web References:

1. http://www.fayoum.edu.eg/stfsys/stfFiles//243//2512//Ch%204%20-%20Principles%20of%20Power%20system.pdf
2. https://www.electrical4u.com/electrical-power-factor/
3. https://www.scribd.com/doc/51540789/ELECTRIC-HEATING-AND-WELDING
4. https://en.wikipedia.org/wiki/Illumination
5. https://en.wikipedia.org/wiki/Railway_electric_traction

Question Paper Pattern:

Internal Assessment:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

ELECTRICAL ENERGY CONSERVATION AND AUDITING (EECA)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
EE408	Professional Elective – V	3	0	0	3	40	60	100
Sessional Exam Duration : $1\frac{1}{2}$ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the various energy forms and its availability, challenges for commercial operation in energy savings.

CO2: Understand the energy saving techniques commercial and industrial premises.

CO3: Apply the knowledge of engineering thermodynamics, energy conversions with energy saving potentials.

CO4: Apply financial appraisal techniques to energy saving projects.

CO5: Understand the procedures of energy auditing and energy management.

UNIT - I	
Energy scenario	Indian energy scenario – Types & forms of energy – An overview of energy consumption and its effects – Reasons to save energy (financial and environmental) - Energy conservation Acts and related policies– Schemes of Bureau of Energy Efficiency (BEE).
UNIT - II	
Energy Efficiency and Economics	Steam systems – Steam Traps – Cogeneration – Principles & Operation– Waste heat recovery – Sources & Grades – Types (Heat Wheel, Recuperators, Regenerators, Heat Pipe etc) – Economics of WHR Systems. Electricity billing– Components & Costs – Determination of kVA demand & Consumption– Time of day tariff – Power factor.
UNIT - III	
Principles of Fuels and Combustion	Fuels and combustion– Stoichiometry – Combustion Principles– Boilers (classification, types, working principle of important types) – Boiler heat loss estimation – Furnaces – Insulation & refractories.
UNIT - IV	
Energy costs and Financial analysis	Understanding energy costs – Benchmarking and energy performance – Fuel and energy substitution – Energy balances–Financial techniques for assessing energy conservation measures – Fixed and variable cost – Interest charges – Simple payback period – Net Present Value - Discounted cash flow method.
UNIT - V	
Energy auditing and Management	Definition & objective of energy management– Energy audit– Types & methodology– Energy audit report format– Instruments– Organizational background desired for energy management – Case studies of energy audit in different industries.

Text Books :

1. Smith CB (2015) Energy Management Principles, Pergamon Press, New York.
2. T. D. Eastop and D.R. Croft (1996), Energy Efficiency for Engineers and Technologists, Longman Harlow
3. Subhash Gadhare, Anup Goel, Siddu, L.D. Jathar, "Energy Audit and Management" Technical Publications, 1st edition, Jun,2018.

Reference Books :

1. LC Witte, PS Schmidt and DR Brown (1998): Industrial Energy Management and Utilization, Hemisphere Publishing Corporation, Washington.
2. Udit Mamodiya, "Electrical Energy Conservation and Auditing" Ashirwad publishers, 1st edition, 2020

Web References:

1. https://www.google.com/search?q=Energy+scenario&rlz=1C1CHBF_enIN868IN868&oq=Energy+scenario&aqs=chrome..69i57j69i59i450l8.496j0j1&sourceid=chrome&ie=UTF-8
2. https://www.google.com/search?q=Energy+Efficiency+and+Economics&rlz=1C1CHBF_enIN868IN8
3. https://www.google.com/search?q=Principles+of+Fuels+and+Combustion&rlz=1C1CHBF_enIN868IN868&oq=Principles+of+Fuels+and+Combustion&aqs=chrome
4. https://www.google.com/search?q=Energy+costs+and+Financial+analysis&rlz=1C1CHBF_enIN868IN
5. https://www.google.com/search?q=energy+audit+and+management+course&rlz=1C1CHBF_enIN868I

Question Paper Pattern:

Internal Assessment:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

ELECTRICAL ESTIMATION & COSTING (EEC)

VII Semester : EEE						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
EE409	Professional Elective - V	3	0	0	3	40	60	100
Sessional Exam Duration : $1\frac{1}{2}$ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic principles of estimation and costing for residential and commercial electrification.

CO2: Understand the guidelines for estimation and costing of residential and commercial electrification.

CO3: Analyze the design and estimation of methods of installation, estimation and testing of underground and over head service connections.

CO4: Analyze the design and estimation of transmission and distribution system.

CO5: Analyze the design and estimation of substation and its switchgear installations.

UNIT - I

General Principles Of Estimation	Introduction to estimation & costing, catalogues, market survey and source selection. Recording of estimates, determination of quantity of material required labour conditions. Determination of material cost and labours. Contingencies, overhead charges, profit, purchase system, purchase enquiry and selection of appropriate purchase mode. Comparative statement, purchase orders, payment of bills. Tender form, Indian electricity Act and major applicable IE rules.

UNIT - II

Electrification of Residential and Commercial installations	General rules and guidelines for wiring of residential and commercial installation and positioning of equipments**,** principles of circuit design in lighting and power circuits. Procedures for designing the circuits. Method of drawing single line diagram. Selection of type of wiring and rating of wires and cables. Load calculations and selection of size of conductor, selection of rating of main switch. Distribution board, protective switchgear ELCB and MCB and wiring accessories for residential installations. Deciding the size of the cables, bus bar and bus bar chambers. Mounting arrangements and positioning of switchboards, distribution boards main switch for commercial installations. Earthing of residential and commercial installations, sequence to be followed for preparing estimate, preparation of detailed estimates and costing of residential and commercial installation.

UNIT - III

Service Connection, Inspection and Testing of Installation	Concept of service connection, types of service connection and their features, method of installation of service connection, estimates of underground and overhead service connections. Inspection and testing of internal wiring installations, new installations. Reason for excess recording of energy consumption by energy meter.

UNIT - IV

Design and Estimation of Overhead Transmission & Distribution Lines	Introduction, Typical AC electrical power system, main components of overhead lines, line supports. Factors governing height of pole, conductor. Determination of size of conductor for overhead transmission line, cross arms, pole brackets and clamps, guys and stays, conductors spacing and clearances, span lengths. Overhead line insulators, insulator materials, types, lightning arrestors, phase plates, danger plates, anti climbing devices, bird guards, beads of jumpers, muffs. Points to be considered at the time of erection of overhead lines, erection of supports, setting of stays, fixing of cross arms, fixing of insulators, conductor erection. Repairing and jointing of conductor, dead end clamps, positioning of conductors and attachment to insulator jumpers, Tee-offs,

	earthing of transmission lines. Guarding of overhead lines, clearances of conductor from ground spacing between conductors, testing and commissioning of overhead distribution lines, some important specifications.
UNIT - V	
Design and Estimation of Substations	Introduction, Classification of substation, indoor substations, outdoor substations. Selection and location of site for substation, main electrical connections, graphical symbols for various types of apparatus and circuit elements in substation. Key diagram of typical substations. Equipment for substation and switchgear installations, substation auxiliary supply, substation earthing.

Text Books :

1. J.B.Gupta "Electrical Installation Estimating & Costing", K. Katria & Sons, 8th Edition , New Delhi .
2. K.R Gangadhara Rao "Electrical Estimating and Energy Management",Sapna. Publications
3. J.B.Gupta, "A Course in Electrical Installation Estimating and Costing" S.K. Kataria & Sons, 9th edition,

Reference Books :

1. K.B.Raina S.K.Bhattacharya, "Electrical Design Estimating and Costing", New Age International
4. S.L.Uppal , G.C Garg "Electrical Wiring Estimating and Costing", ,Khanna Publishers,New Delhi.

Web References:

1. https://lincoln.ne.gov/city/ltu/engine/dconst/gpp/pdf/costest.pdf
2. https://www.slideshare.net/gauravhtandon1/electrical-systems-in-a-building
3. http://engineering.electrical-equipment.org/safety/inspection-and-testing-of-wiring-installations.html
4. https://www.puc.nh.gov/2008IceStorm/Final%20Reports/2009-10-30%20Final%20NEI%20Report%20With%20Utility%20Comments/Chapter%204%20-%20System%20Planning,%20Design,%20Construction%20and%20Protection.pdf
5. https://www.academia.edu/6909375/Design_and_Costs_Estimation_of_Electrical_Substations_Based_on_Three-Dimensional_Building_Blocks.

Question Paper Pattern:

Internal Assessment:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consists of three sections with Two Questions (EITHER/OR TYPE) in each section. The students shall answer one question from each section.

End Exam

Question paper for End examination shall be for 60 marks. The question paper shall contain Five units with Two questions (EITHER/OR TYPE) in each unit. Each of these questions may be contain sub-questions and the student should answer any one question from each unit. Each question carries 12 marks.

Open Elective-I

OE301	Optimization Techniques
OE302	Remote Sensing & GIS
OE303	Introduction to JAVA
OE304	Internet of Things
OE305	Scientific Programming with Python
OE306	Introduction to Database Systems
OE307	Ethical Hacking
OE308	Entrepreneurship Development
OE309	Introduction to Information Systems
OE310	Neural Networks & Fuzzy Logic

Open Elective-II

OE311	Renewable Energy Sources
OE312	Industrial Safety
OE313	Web Technologies
OE314	Introduction to Cyber Security
OE315	Nano Technology
OE316	Disaster management
OE317	Project management
OE318	Advanced Information Systems
OE319	Product Lifecycle Management
OE320	Industry 4.0

Open Elective-III

OE401	Multimodal Transportation Engineering
OE402	Air pollution and control
OE403	Industrial Robotics
OE404	Quality & Reliability Engineering
OE405	Smart Grid Technologies
OE406	Artificial Intelligence and Machine Learning
OE407	Distributed Embedded Systems
OE408	Natural Language processing
OE409	Design Thinking
OE410	Cloud, Micro services & Application
OE411	Block Chain Technologies
OE412	Agile Methodologies
OE413	Augmented Reality & Virtual Reality

Open Elective-IV

OE414	Composite Materials
OE415	Image Processing
OE416	Mobile Computing
OE417	Enterprise systems
OE418	Modern Web Applications
OE419	Cognitive Radio
OE420	Automation & Control
OE421	Human Resource Management
OE422	Design Patterns
OE423	Prestressing Systems
OE424	Additive Manufacturing Technology
OE425	Drone Technology
OE426	Infrastructure for Smart City Development

OPTIMIZATIONTECHNIQUES (OT)								
V Semester : B.Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC301	**Open Elective - I**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration:1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the concepts of Optimization and solve linear programming problems

CO2: Solve the engineering problems using Integer programming technique

CO3: Solve the engineering problems using Kuhn tucker conditions and Lagrangean multiplier method

CO4: Solve the engineering problems using dynamic programming technique

CO5: Apply non-traditional optimization techniques to solve engineering problems.

UNIT - 1

Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Classification of Optimization problems.

Linear Programming Problems:
Simplex method, Big-M method, Sensitivity Analysis, Duality, Dual simplex method, Interpretation.

UNIT-2

Integer Programming Technique:

Simple applications of integer programming, solution methods of integer programming-Branch and Bound Algorithm, Cutting Plane Algorithm

UNIT-3

Classical Optimization Techniques:

Single variable optimization with and without constraints, multi – variable optimization with and without constraints, methods of Lagrange multipliers, Kuhn-Tucker conditions

UNIT-4

Dynamic Programming Technique:

Elements of dynamic programming model, Back ward recursive equation, Applications of Dynamic Programming to Linear programming and Capital budgeting.

UNIT-5

Genetic Algorithm:

Introduction, Difference between Genetic Algorithm and Traditional Methods, Simple Genetic Algorithms, Similarity Templates (Schemata), Genetic algorithm operators –selection, crossover and mutation. Simple applications of GA.

Evolutionary Algorithms:

Evolutionary Algorithums: Ant colony algorithm, Tabu search algorithm and Particle swam optimization algorithm.

TextBooks:

1.Rao S.S, –Optimization, Wiley Eastern, New Delhi, 1995

2. S.D. Sarma, –Operations Research, Kedarnath Ramnath & Co

3. David E.Goldberg,–Genetic Algorithms, Pearson Education

Reference Books:

1. HamdyA.Taha, –Operations Research, Prentice Hall of India.

2. Kalyanmoy Deb,–Optimization for Engineering Design, Prentice Hall, New Delhi, 2000

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

REMOTE SENSING & GIS (RSGIS)								
V Semester: B.Tech.						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC302	**Open Elective - I**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the Photogrammetry, EDM and Total station surveying principles to solve surveying problems using appropriate tools and techniques.

CO2: Understand the concepts of remote sensing and interpretation methods.

CO3: Understand the importance of maps, concept of map projections.

CO4: Understand the concept of GIS and its applications, different data models, spatial analysis.

CO5: Understand the principles used in GNSS and Drone surveying, data collection methods, error in observations and corrections.

UNIT – I

Aerial Photogrammetry: Stereoscopy– 3-D Model – Height determination using Parallax Bar– Digital Elevation Model (DEM) – Slope.

Land Surveying: Various Levels – Levelling methods–Total Station– EDM– Working principle – Parts of Total Station – Capabilities and applications of Total Station– Traversing – Triangulation and Trilateration.

UNIT - II

Remote Sensing: Basic concept– Electromagnetic spectrum– Spectral signature – Resolutions –Spectral. Spatial, Temporal and Radiometric – Platforms and Sensors – Remote Sensing Data Products – PAN – Multispectral, Microwave, Thermal, Hyper spectral– Visual and digital interpretation methods.

UNIT – III

Maps: Importance of maps to engineering projects – Types of maps– Scales and uses– Plotting accuracy – Map sheet numbering – Coordinate systems – Cartesian and geographical, map projections, mapdatum–MSL, Geoid, Spheroid,WGS-84.

UNIT – IV

GIS: Introduction– Data Sources – Data Models and Data Structures– Algorithms, DBMS – Creation of Databases (spatial and non-spatial) – Spatial analysis – Interpolation –Buffer, Overlay – Terrain Modelling and Network analysis.

Remote Sensing and GIS Applications: Land use / Land cover classification – Rainfall-runoff studies – Flood and drought impact assessment and monitoring – Regional and urban planning and management – GIS based highway alignment.

UNIT - V

GNSS: Principle used – Components of GNSS– Data collection methods – DGPS – Errors in observations and corrections.

Drone Surveying: Working principle – Benefits of drones in surveying – Applications – Interior and exterior drone surveying – Calculation of length, area and stockpile volume.

Text Books:

1. M. Anji Reddy, Text Book of Remote Sensing and Geographic Information System, BS Publication.
2. Lo C.P. &Yeung A.K.W., Concepts and Techniques of GIS, Prentice-Hall of India, New Delhi.
3. Thomas Lillesand, Ralph W Kiefer and Jonathan Chipman, Remote Sensing and Image Interpretation, John Wiley & Sons, India.
4. Hofmann-Wellenhof, Lichtennegger and Wasle, GNSS: Global Navigation Satellite Systems, Springer -

Verlag Wein, New York.

Reference Books:

1. B.Bhatta, Remote sensing and Geographic Information System, Oxford Publications.
2. Siddiqui M.A., Introduction to Geographical Information System, Sharda Pustak Bhavan, Allahabad.
3. Curran, Paul J, Principles of Remote Sensing, Longman, London.
4. Floyd F Sabins Jr., Remote Sensing Principles and Interpretation, Freeman and Co., San Francisco.

Web References:

1. https://nptel.ac.in/courses/105/101/105101206/
2. https://nptel.ac.in/courses/105107155
3. https://nptel.ac.in/courses/105/107/105107194/

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

INTRODUCTION TO JAVA (ITJ)

V Semester : B.Tech | **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC303	Open Elective - I	3	-	-	3	40	60	100

Sessional Exam Duration 1½ Hrs | **End Exam Duration:** 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Understand fundamentals of oops concepts, input and output

CO2: Understand the classes and objects.

CO3: Understand the Inheritance and interfaces

CO4: Understand the string handling methods

CO5: Understand the exception handling

UNIT – I

Object oriented concepts: Fundamentals, Overview of Java, Data types, variables, Operators, control statements, Reading console input, writing console output, arrays.

UNIT – II

Introducing Classes: Class fundamentals, declaring objects, introducing methods, Constructors, this keyword, finalize

UNIT – III

Inheritance: Inheritance basics, using super, method overriding, abstract class, using final with inheritance, Interfaces: Defining interface, implementing interface

UNIT – IV

String Handling: String constructors, Special string operations, character extraction, string comparison, searching strings, modifying strings. StringBuffer class and its methods.

UNIT – V

Exception Handling: Fundamentals, exception types, try, catch, throw, throws, finally. Java built-in exceptions, creating your own exception subclasses.

Text Books :

1. Herbert Schildt [2008], [9th Edition], The Complete Reference Java2, TATA McGraw-Hill.
2. E Balaguruswamy [2007], [3 rd Edition], Programming with Java, A Primer, TATA McGraw- Hil.

Reference Books :

1. Bruce Eckel [2008], [2nd Edition], Thinking in Java, Pearson Education.
2. H.M Dietel and P.J Dietel [2008], [6th Edition], Java How to Program, Pearson Ed.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

INTERNET OF THINGS (IoT)								
V - Semester : B.Tech						**Scheme : 2020**		
Course Code	**Course Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC304	**Open Elective - I**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic knowledge of Internet of things and its design

CO2: Understand the purpose of sensors and Actuators in IoT

CO3: Analyze Various IoT Protocols

CO4: Design IoT Projects Using Arduino

CO5: Understand Raspberry-Pi Processor and Raspbian Operating Systems

UNIT – I

Introduction to IoT:
Definition and Characteristics of IoT, Physical Design and Logical Design, IoT Enabling Technologies, IoT Levels and Deployment Templates, IoT Vs M2M

UNIT – II

Sensing and Actuation:
Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT

UNIT – III

Wireless Technologies and Data Transmission for IoT:
Wi-Max, Wi-Fi (802.11), Bluetooth/Bluetooth smart, Zigbee/Zigbee smart, Cellular, NFC, Serial Transmission, RS-232, RS-485, I2C Inter-Integrated Circuit, Ethernet, CAN bus, USB, Firewall, SerialATA, Parallel Transmission

UNIT – IV

Building IoT with Arduino:Arduino IDE, Programming of Arduino, Interfacing LED, switch, potentiometer, Sensors, LCD, Bluetooth, Wi-Fi, ,GPS, RFID with Arduino

UNIT –V

Raspberry Pi :
Linux basics, Linux File system, Navigating the File system, Text Editors, Accessing Files, Permissions , Processes, Linux Graphic user Interface , Raspberry Pi Processor, Raspberry Pi Vs Arduino, Operating system benefits, Raspberry Pi Set up, Configuration,

Text Books :

1. ArsheepBahga , Vijay Madisetti ,Internet of Things: A Hands-On Approach Paperback,2015
2. Rajkumar Bhuyya, Internet of Things: Principles and Paradigms, 2016.
3. Adeel Javed , Building Arduino Projects for the Internet ofThings,Apress,2016.
4. Wolfram Donat, Learn Raspberry-Pi with Python, Apress,2016

Web References:

1. https://nptel.ac.in/courses/106105166/
2. https://onlinecourses.nptel.ac.in/noc17_cs22/course
3. https://nptel.ac.in/courses/108108098/4
4. https://onlinecourses.nptel.ac.in/noc19_ee28

Question Paper Pattern:

Sessional Exam:
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first

sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks

SCIENTIFIC PROGRAMMING WITH PYTHON (SPY)								
V Semester: B.Tech						**Scheme: 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC305	**Open Elective - I**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**-**	**-**	**3**	**40**	**6**	**100**
Sessional Exam Duration: 1½ Hrs						**End Exam Duration:3 Hrs**		

Course Outcomes: At the end of the course student will be able to

CO1: Understand programming with mathematical formulas.

CO2: Apply the concepts of Loops, lists, Functions and Branching.

CO3: Work with Input, Error Handling and Modules.

CO4: Learn to visualize mathematical functions and mathematical calculations.

CO5: Work on Dictionaries and Strings.

CO6: Apply the concepts of Object Oriented Programming.

UNIT– I

Getting Started with Python: The First Example: Hello, World!, Different Ways to Use Python.
Computing with Formulas: Programming Simple Mathematics, Variables and Variable Types, Formatting Text Output, Importing Modules, Pitfalls When Programming Mathematics.

UNIT– II

Loops and Lists: Loops for Automating Repetitive Tasks, Boolean Expressions, Using Lists to Store Sequences of Data, Iterating Over a List with a for Loop, Nested Lists and List Slicing, Tuples.
Functions and Branching: Programming with Functions, Function Arguments and Local Variables, Default Arguments and Doc Strings, If-Tests for Branching the Program Flow, Functions as Arguments to Functions, Solving Equations with Python Functions, Writing Test Functions to Verify our Programs.

UNIT– III

User Input and Error Handling: Reading User Input Data, Flexible User Input with eval and exec, Reading Data from Files, Writing Data to Files, Handling Errors in Programs, Making Modules.

UNIT– IV

Arrays and Plotting: NumPy and Array Computing, Plotting Curves with Matplotlib, Plotting Discontinuous and Piecewise-Defined Functions, Making a Movie of a Plot, More Useful Array Operations.
Dictionaries and Strings: Dictionaries, Example: A Dictionary for Polynomials, Example: Reading File Data to a Dictionary, String Manipulation.

UNIT– V

Classes: Basics of Classes, Protected Class Attributes, Special Methods, Example: Automatic Differentiation of Functions, Test Functions for Classes, Example: A Polynomial Class.
Object-Oriented Programming: Class Hierarchies and Inheritance, Example: Classes for Numerical Differentiation, Example: Classes for Numerical Integration.

Text Books :

3. Joakim Sundnes, Introduction to Scientific Programming with Python, Springer Open, 2020.

Reference Books :

1. Christian Hill, Learning Scientific Programming with Python, Cambridge University Press, 2 edition, 2020.

Web References:

1. https://www.tutorialspoint.com/scipy/index.htm
2. https://realpython.com/

3. https://www.w3schools.com/python/scipy/index.php

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

INTRODUTION TO DATABASE SYSTEMS (IDBS)

V Semester : B.Tech						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC306	Open Elective - I	3	-	-	3	40	60	100
Sessional Exam Duration 1½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of Database Management Systems and Entity Relationship Modelling.

CO2: Use SQL commands to create, retrieve, update, and delete data from the Data base.

CO3: Comprehend the concepts of Normalization techniques

CO4: Understand the properties of Transactions in a Database System.

CO5: Understand Concurrency Control techniques and Recovery System.

UNIT – I

Introduction: Introduction to DBMS, Purpose of Database Systems, Database System Applications, View of Data, Data Models, Database Users, Database Architecture.
Entity-Relationship Model: Basic Concepts, Cardinality of Relationship, ER Diagram Notations, Entity-Relationship Diagrams, Modeling using ER Diagrams, Reduction of an E-R Schema to Tables

UNIT – II

Relational Query Languages: SQL, Data Definition Language Commands, Data Manipulation Language Commands and Data Control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectivity's – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations.

UNIT – III

Relational Database Design: Features of Good Relational Database Designs, Decomposition, Normalization, Functional Dependency, Types of Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form (BCNF)

UNIT – IV

Transactions: ACID properties, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.
Serializability : Conflict Serializability, View Serializability

UNIT – V

Concurrency Control: Lock-Based Protocols – Locks, Granting of Locks, The Two-Phase Locking Protocol.
Recovery System: Failure Classification, Log-Based Recovery, Shadow Paging Technique

Text Books:

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw Hill, 7 th Edition, 2019.

Reference Books:

1. Principles of Database and Knowledge – Base Systems, J. D. Ullman, Vol. 1, 2016.
2. Fundamentals of Database Systems. R. Elmasri and S. Navathe, 7th Edition, 2017.
3. Data Base Management Systems, Raghu Ramakrishna and Johnannes Gehrke, McGraw Hill, 3rd Edition, 2014.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

ETHICAL HACKING (EH)

V Semester : B.Tech						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC307	**Open Elective - I**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basics of security and ethical hacking.

CO2: Understand about foot printing and types of attacks in social engineering.

CO3: Understand about sniffers, hijacking and DoS attacks.

CO4: Understand the importance of web server hacking, database hacking and SQL Injection.

CO5: Understand about Wireless technologies, intrusion detection and firewalls.

UNIT – I

Introduction to Ethical Hacking: Introduction, Security fundamentals, Security testing, Hackers and Crackers description, Ethical Hackers.
Technical Foundations of Hacking: The Hacking process, Information Security Systems and the Stack.

UNIT – II

Foot printing: Information Gathering Methodology, OS Fingerprinting, Fingerprinting Services, Enumeration, System Hacking.
Social Engineering: Social Engineering, Malware threats, Vulnerability analysis.

UNIT – III

Sniffers: Passive sniffing, Active sniffing, ARP, ARP poisoning and MAC flooding, tools for sniffing, wire shark, sniffing and spoofing countermeasures.
Session Hijacking: Transport layer Hijacking**,** Application layer Hijacking, Session Hijacking Tools.
Denial of Service: DoS attack techniques, Distributed DoS, DDoS tools.

UNIT – IV

Web Server Hacking: HTTP protocol, scanning web servers, Banner grabbing and Enumeration, Web server, DoS/ DDoS and DNS attacks.
Database Hacking: Introduction to SQL and SQL injection and categories, Finger printing, UNION Exploitation technique, Boolean in SQL injection attacks, Out-of band exploitation, exploring the time-delay SQL injection technique, Stored procedure SQL injection and mitigations, SQL injection hacking tools.

UNIT – V

Wireless Technologies, Mobile Security: Mobile device operation and security, Wireless LAN's-Basics, Wireless LAN frequencies and signalling, Wireless LAN security.
IDS - Intrusion Detection and Prevention Systems. Firewalls and Honey pots.

Text Books:

1. Micheal Gregg,"Certified Ethical Hacker (CEH) Cert Guide",Pearson education, 2020.

Reference Books:

1. EC-Council,"Ethical Hacking and Countermeasures(CEH)",CENGAGE Learning, 2020.
2. Sai Satish,"Hacking Secrets Part-1",Indian Servers,2018.
3. David Litchfield,Chris Anley"The Database Hackers Handbook:Defending Database Servers", Wiley.

Question Paper Pattern:

Sessional Examination:
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

ENTREPRENEURSHIP DEVELOPMENT (EDP)

V Semester: B.Tech | **Scheme : 2020**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OEC308	Open Elective - I	3	-	-	3	40	60	100

Sessional Exam Duration : 1 ½ Hrs **End Exam Duration : 3 Hrs**

Course Outcomes: At the end of the course, students will be able to

CO1: Analyse the role of entrepreneurship in economic development

CO2: Understand rural entrepreneurship and small enterprises

CO3: Examine the project reports

CO4: Understand the ownership structure of company and women entrepreneurship in India

CO5: Understand the support by specified institutions for entrepreneurship development

UNIT – I

Entrepreneur: Concept of an entrepreneur; Definition of an entrepreneur; Types of entrepreneurs; Characteristics of an entrepreneur.

Entrepreneurship: Introduction; Elements of entrepreneurship; Six important segments of entrepreneurship environment; Advantages of entrepreneurship; Barriers to entrepreneurship; Role of entrepreneurship in economic development.

UNIT – II

Rural Entrepreneurship: Meaning; Need; Retrospection of rural industrialization in India; Problems of rural entrepreneurship; Development plan for rural entrepreneurship.

Small Enterprises: Definition of SSI; Types, Characteristics of SSI; Role of SSI in economic development; Problems faced by SSI.

UNIT – III

Project Planning: Project Identification; Project Selection; Project Report – Contents & Formulation; Methods of Project Appraisal – Market Feasibility, Technical Feasibility, Financial Feasibility and Economic Feasibility.

UNIT – IV

Ownership Structures: Sole Proprietorship; Partnership; Company; Co-operative; Selection of appropriate ownership structure.

Women Entrepreneurship in India: Introduction; Policies and Schemes for Women Entrepreneurs; Factors Influencing the Women Entrepreneurship; Types of Women Entrepreneurs; Challenges for Women Entrepreneur.

UNIT – V

Institutional Finance: Commercial banks; Other Financial Institutions – IFCI, IRBI, SFC, SIDC & EXIM Bank.

Institutional Support: Need; Support to Small Entrepreneurs – DICs, Industrial infrastructure corporation, and National institute for MSME, Incubation Centers (Government and private).

Text Books:

Prof. Satish C. Ailawadi & Mrs. Romy Banerjee, “Principles of Entrepreneurship”, Everest Publishing House.

S. S. Khanka, “Entrepreneurial Development”, S. Chand, New Delhi.

Robert D. Hisrich, Michael P. Peters, Dean A. Sheperd, “Entrepreneurship”, McGraw-Hill,6 ed.

Reference Books:

Poornima M. Charantimath, “Entrepreneurship Development and Small Business Enterprises”, 2e, Pearson.

Arya Kumar, “Entrepreneurship”, 4 e, Pearson.
Ram Chandran, “Entrepreneurial Development”, Tata McGraw Hill, New Delhi

uestion Paper Pattern:

ssional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

INTRODUCTION TO INFORMATION SYSTEMS (IIS)								
V Semester : B.Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC309	**Open Elective - I**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of Computer architecture and functionalities of System Software.

CO2: Understand the page replacement and CPU Scheduling Algorithms

CO3: Understand the phases of software development life cycle and process models.

CO4: Design ER model for real life scenarios

CO5: Apply SQL commands to create, update, modify and retrieve data from the data bases.

CO6: Apply normalization techniques to normalize the database

UNIT – I

Fundamentals of Computers & Computer Architecture: Introduction, Organization of a small computer, Central Processing Unit, Execution cycle, Instruction categories, measure of CPU performance, Memory, Input/output devices, BUS, addressing modes

System Software: Assemblers, Loaders and linkers, Compilers and interpreters.

UNIT – II

Operating System: Introduction, Memory management schemes, Page replacement algorithms, Process management, CPU scheduling algorithms.

Software engineering: Software engineering: Introduction to Software engineering, Life cycle of a software project, software Development models.

UNIT – III

Relational Database Management System: Introduction to DBMS, the database technology, data models, Database Users.

Entity Relationship (E-R) Modeling: Introduction, Notations, Modeling E-R Diagrams, Case Studies, Merits and Demerits of E-R modeling.

UNIT – IV

Structured Query Language (SQL): Introduction to SQL, Data types, Data Definition language commands, Data Manipulation Language Commands and Data control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Logical Connectives – AND, OR, Range Search, Pattern Matching, Order By, Group By, Set Operations – Union, Intersect and Minus, Aggregate Functions, Join Operations

UNIT – V

Normalization:

Introduction, Need for Normalization, Process of Normalization, Types of Normal Forms (1NF, 2 NF,3 NF & BCNF), Merits and Demerits of Normalization.

Text Books:

1. Campus Connect Foundation Program – Computer Hardware and System Software Concepts, Programming Fundamentals- Vol. – 1, INFOSYS
2. Campus Connect Foundation Program – Relational Database Management System, Client Server Concepts, Introduction to Web Technologies - Vol. – 4, INFOSYS

3. Henry F. Korth& Abraham Silberschatz, - Data Base System Concepts, 5th Edition, 2005, Mc Graw hill

Reference Books:

1. M. Morris Mano [2011], [3 rd Edition], Computer system architecture, Pearson Education, 2011.
2. Sommerville [2008], [7th Edition], Software Engineering, Pearson education.
3. Raghu Ramakrishna and Johannes Gehrke [2003], [3rd Edition], Data Base Management Systems, TATA McGraw Hill
4. Tanenbaum [2000], Modern Operating System, Pearson Education

Web References:

1. https://www.w3schools.com/sql/
2. https://www.geeksforgeeks.org/dbms/
3. https://www.tutorialride.com/software-engineering/software-engineering-tutorial.htm

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

NEURAL NETWORKS AND FUZZY LOGIC (NNFL)

V Semester: B.Tech | **Scheme: 2020**

Course Code	Course Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC310	Open Elective - I	3	0	0	3	40	60	100

Sessional Exam Duration: 1 ½ Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes: At the end of the course the student will be able to

CO1: understand the basic concepts of Neural networks

CO2: analyze Supervised Learning feedback networks

CO3: analyze Unsupervised Learning feedback networks.

CO4: understand concepts of fuzzy logic and fuzzy set theory

CO5: To apply the knowledge of Neural Networks & fuzzy logic to real time systems.

UNIT – I

Introduction to Neural Networks and its Basic Concepts

Biological neurons and McCulloch and Pitts models of neuron, Types of activation functions, Neural networks architectures, Linearly separable and linearly non-separable systems and their examples, Features and advantages of neural networks over statistical techniques, Knowledge representation, learning process, error-correction learning, concepts of supervised, learning, and unsupervised learning..

UNIT – II

Supervised Learning Neural Networks

Single layer perceptron and multilayer perceptron neural networks, their architecture, Back propagation algorithm, generalized delta rule, learning factors, step learning, Momentum learning, Concept of training, testing and cross-validation data sets for design and validation of the Networks

UNIT – III

Unsupervised Learning Neural Networks

Competitive Learning networks, kohenen self-organizing networks, K-means and LMS algorithms, RBF neural network and its structure, Hybrid training algorithm for RBF neural networks, Comparison of RBF and MLP networks Learning, Hebbian learning, Hopfield networks.

UNIT – IV

Fuzzy logic

Basic Fuzzy logic theory, sets and their properties, Operations on fuzzy set, Fuzzy relation and operations on fuzzy relations and extension principle, Fuzzy membership functions and linguistic variables, Fuzzy rules and fuzzy reasoning, Fuzzification and defuzzification and their methods, Fuzzy inference systems

UNIT – V

Applications of Neural Networks & Fuzzy systems

Applications of Neural Networks: Pattern classification, Handwritten character recognition, Face recognition, Image compression and decompression

Applications of Fuzzy Logic & Fuzzy System: Fuzzy pattern recognition, Fuzzy image processing, Simple applications of Fuzzy knowledge-based controllers like washing machines, traffic regulations, and lift control

Text Books :

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley and sons, 3/e, 2010.
2. S. Haykin, Neural Networks, A Comprehensive Foundation, Pearson Education Inc.3/e, 2008.
3. Jacek. M. Zurada, -Introduction to Artificial Neural Systems, Jaico Publishing House, 2006.
4. LaureneFausett, Fundamentals of Neural Networks-Architectures, algorithms and applications, Pearson Education Inc., 2004.

5. J.S.R. Jang, C.T. Sun, E. Mizutani,, -Neuro Fuzzy and Soft Computing - A computational Approach to Learning and Machine Intelligence, Pearson Education Inc., 2002.
6. Bart Kosko, Neural networks and Fuzzy Systems, Pearson Education

Reference Books :

1. T.Pradeep, Nano: The Essentials Understanding Nano Science and Nano Technology, Tata McGraw Hill, 2013.
2. Richard Booker and earl Boyson, Nanotechnology: The Fun and Easy Way to Explore the Science of Matters Smallest Particle, Wiley Publications, 2011.

Web References:

1. S. Rajsekaran and G. A. VijaylakshmiPai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI
2. N. Sivanandam, S. Sumathi, and S. N. Deepa, Introduction to Neural Network Using MATLAB11, Tata McGraw-Hill Publications
3. S.N.Sivanandam. M.Pau1Raj, - Introduction to Artificail Neural Networks, Vikas Publication House Pvt.Ltd, NewDelhi

Question Paper Pattern:

Sessional Exam:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions and the student should answer any one question from each unit. Each Question carries 12 marks.

RENEWABLE ENERGY SOURCES (RES)

VI Semester B.Tech — **Scheme : 2020**

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC311	Open Elective - II	3	-	-	3	40	60	100

Sessional Exam Duration : 1 ½ Hrs — **End Exam Duration : 3 Hrs**

Course Outcomes : At the end of the course students will be able to

CO1: Understand various sources of energy and solar geometry.

CO2: Describe the process of harnessing solar energy in the form of heat.

CO3: Explore basic terms of wind and the extraction of energy from wind.

CO4: Understand the technologies involved in extraction of biomass energy and geothermal Energy.

CO5: Understand Tidal, Wave and Ocean energy conversion methods and concepts of emerging technologies.

UNIT – I

Introduction and Energy Conservation: Classification of energy sources-Importance of renewable energy sources and energy chain-Principles of energy conservation –Energy conservation opportunities. World energy status & Energy Scenario in India.

Fundamentals of Solar Energy: Extra-terrestrial and terrestrial radiation- Solar constant and solar radiation geometry- time and day length-Estimation of monthly average daily total radiation on horizontal surface and tilted Solar surface-Measurements of radiation data. Basic principle & classification of PV cell

UNIT – II

Solar Thermal Systems: Solar collectors & its classification - Solar water heating-solar passive space heating and cooling systems-Solar refrigeration system – Solar thermal power generation-Solar Distillation-solar drier-solar pond.

UNIT – III

Wind Energy: Origin of wind-nature of winds-Applications of wind power –energy estimation of wind – power extraction from wind-Betz limit-Components of wind turbine- horizontal axis wind turbine & vertical axis wind turbine -Types of blades

UNIT – IV

Biomass Energy: Photosynthesis process- Biomass conversion technologies- Biogas production - Types of digester- Factors affecting the digester performance – Biomass liquefaction – Biomass to ethanol production.

Geothermal Energy: Types of geothermal energy resources-Energy conversion through geothermal energy resources-Environmental consideration

UNIT – V

Ocean Thermal Energy Conversion: Principle of OTEC- Anderson and Claude cycles, Tidal and Wave energy conversion methods

Emerging Technologies: Principle of magneto hydro dynamics, Fuel cell, Hydrogen energy

Text Books:

1. B.H. Khan, Non-conventional Energy Sources, 3rd edition TMH Publishers, New Delhi
2. G.D Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi

Reference Books:

1 Suhas P.Sukhatme., Solar energy: Principles of thermal collection and storage, Tata McGraw Hill publishing Co. Ltd

2 S. Rao and Paulekar, Energy Technology, Khanna Publishers, New Delhi

3 H. P. Garg, J. Prakash, Solar energy fundamentals and applications, Tata McGraw Hill publishing Co. Ltd

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

INDUSTRIAL SAFETY (IS)

VI Semester	B.Tech				Scheme : 2020			
Course Code	**Category**	**Hours /Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OEC312	**Open Elective - II**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1½ Hrs					**End Exam Duration : 3 Hrs**			

Course Outcomes: At the end of the course, students will be able

CO1: To understand the principles of safety management including safety audit, safety education and accident investigation

CO2: To understand the causes and implication of fire and explosion and the preventive measures

CO3: To understand machine and construction safety assessment and safeguarding methods

CO4: To understand the effect of toxic substances and hazardous chemicals

CO5: To understand the modes of electrical hazards and safety measures in electrical and information technology industries

UNIT –I

Safety in Engineering Industry- Safety need, General hazards and control measures in engineering industry, Four significant industrial disasters happened in the world (Bhopal, Chernobyl, Flixborough, Rana plaza),Safety audit- procedure

Accident Investigation- Learning from accident, Layered investigations, Investigation process and summary

UNIT –II

Fire Safety: The fire triangle, Explosions, Distinction between fire and explosions, Flammability characteristics of liquids and vapours, Fire protection techniques, Fire extinguishers, Fire hazard and analysis, Prevention of fire, Steps after occurrence of fire, Fire detection, Fire alarmand firefighting systems, Explosion proof equipment and instruments

UNIT –III

Machine Safety: Machine guarding, Machine guarding assessment, Safeguarding machines and equipment, Guards, Safeguarding devices, Other potential safeguards

Construction Safety: Scope, Safety in -Underground works, Above ground works, Under waterworks, Demolition works.

UNIT –IV

Chemical Safety: Hazardous chemicals, Definition of a hazardous chemical, Toxic effects, Working with toxins, Storing hazardous chemicals, Process hazards, Transportation of hazardous chemicals, Chemical waste management, Hazardous chemical emergency procedures, Worker contamination, Chemicals and worker health

UNIT – V

Electrical Safety: Electrical dangers, Electrical pathways, Static electricity, Result of electrical contact, Shockversus electrocution, Electrical burns, Handling electrical hazards, Controlling electrical hazards, Training, Safety and Health program

IT Industry Safety: Hazardous in IT industry, General precautions, Employer's responsibility, Employees responsibilities, Office ergonomics, Computer workstation – health & safety tips, Laptop safety precautions

Text Books:

1. L. M. Deshmukh. Industrial Safety and Management. McGraw Hill Education (India)
2. D. A. Crowl and J. F. Louvar, Chemical Process Safety (Fundamentals with Applications), Prentice Hall, 2011.

3. Reese, Charles D. Industrial Safety and Health for People-oriented Services. CRC Press, 2008.
4. M. P. Poonia, S. C. Sharma. Industrial Safety and Maintenance Management. Khanna Book Publishing, 2019.

Reference Books:

1. Reese, Charles D. Industrial Safety and Health for Infrastructure Services. CRC Press, 2009.
2. R. K. Jain, Sunil S. Rao, Industrial Safety and Health and Environment Management Systems, Khanna Book Publishing, 2000.
3. K. U. Mistry. Fundamentals of Industrial safety and Health, Siddharth Prakashan Publisher,2008.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

WEB TECHNOLOGIES (WT)

VI Semester : B.Tech — **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC313	Open Elective - II	3	-	-	3	40	60	100

Sessional Exam Duration : 1½ Hrs — **End Exam Duration: 3 Hrs**

Course Outcomes : At the end of the course the student will be able to

CO1: Design a Web Page using Text Formatting Tags, Hyperlinks

CO2: Develop a webpage with Images, Tables Hyperlinks, Lists, CSS.

CO3: Design dynamic web pages using JavaScript

CO4: Design a Form using HTML Forms & Controls

CO5: Understand the basic concepts of PHP and database connection using XAMPP Server.

UNIT – I

HTML5: Overview of HTML5 and other web technologies, HTML5 and its essentials, Fundamentals of HTML5,Working with Text and organizing Text in HTML, Working with Links and URLs.

UNIT – II

Images: Working with Images, Image Maps, Creating Tables, Frames

CSS: Overview of CSS, Backgrounds and Color Gradients in CSS, Fonts and Text Styles, List Styles, Table Layouts,

UNIT – III

JavaScript: Overview of java script, Functions, Events, Java script Objects, Working with Browser Objects, Document Object, Document Object Model, Validation, Errors, Exception Handling in JavaScript.

UNIT – IV

Forms: What's a Form? What Controls are available? Creating a Form and adding HTML Controls, Submitting Data from forms, Customizing Controls in CSS, Form validation using Java Script, Interactive Elements.

UNIT – V

Introduction to PHP: Installing and Configuring PHP: Building PHP with Apache on Windows, The Basics of PHP scripts. The Building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants. Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, XAMPP Server configuration.

Text Books:

1. HTML5 Black Book, 2nd Edition, Dreamtech Press, 2016.
2. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
3. Julie C. Meloni, PHP MySQL and Apache, SAMS Teach yourself, Pearson Education (2007).

Reference Books:

1. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
2. Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development,2018
3. Jeffrey C and Jackson, ―Web Technologies A Computer Science PerspectivePearsonEducation, 2011.
4. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

Web References:

1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3. https://www.w3schools.com/php/

Question Paper Pattern:

Sessional Examination:
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

INTRODUCTION TO CYBER SECURITY (ICS)								
VI Semester : B.Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OE314	**Open Elective - II**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Discriminate and analyze the problems in cybercrime.

CO2: Identifying different classes of attacks.

CO3: Synthesize cybercrime issues on wireless and mobile devices.

CO4: Use and apply modern cyber forensics tools.

CO5: Analyze the computer forensic problems for feasible solutions.

UNIT – I

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.

UNIT – II

Cyber offenses: How Criminals Plan Them– Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT – III

Cyber crime Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones. Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT – IV

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing.

UNIT – V

Cyber Security: Organizational Implications: Introduction, Cost of Cyber crimes and IPR issues, Web threats for Organizations, Security and Privacy Implications. **Social media marketing:** Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, Micheal E.Whitman and HerbertJ. Mattord, Cengage Learning.

Reference Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Cyber Security Essentials, James Graham, Richard Howardand Ryan Otson, CRC Press.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

NANO TECHNOLOGY (NNT)

VI - Semester: B.Tech						Scheme: 2020		
Course Code	Category	Hours/ Week			Credits	Maximum Marks		
OEC315	Open Elective - II	L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
		3	-	-	3	40	60	100
Sessional Exam Duration: 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the principles behind nanotechnology and nanomaterials

CO2: Analyze the fabrication, characterization, and manipulation of nanomaterials,

CO3: Understand about metal nano particle based sensors

CO4: Analyze about nano wire based sensors.

CO5: Understand Sensors Based on Nanostructures of Metal Oxides

UNIT – I

Introduction to Nanotechnology:
Definition of nanotechnology; main features of nanomaterials; types of nanostructures (0D, 1D, and 2D structures); nanocomposites; and mainchemical/physical/electrical/optical properties of nanomaterials. Methods for characterizing the nanomaterials: Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and Spectroscopy.

UNIT – II

Introduction to Sensors' Science and Technology:
Definition of sensors; main elements of sensors; the parameters used for characterizing the performance of sensors: accuracy, precision, sensitivity, detection limit, dynamic range, selectivity, linearity, resolution, response time, hysteresis, and life cycle.

UNIT –III

Metal nano particle-based Sensors:
Definition of nano particle; features of nano particles; and production of nano particles by physical approach (laser ablation) and chemical approaches (Brust method, seed-mediated growth, etc.). Quantum Dot Sensors. Definition of quantum dot; fabrication techniques of quantum dots;

UNIT – IV

Nanowire-based Sensors:
Definition of nanowires; features of nanowires; fabrication of individual nanowire by top-down approaches and bottom-up approaches; and fabrication of nanowire arrays (fluidic channel, blown bubble film, contact printing, spray coating, etc.).Carbon Nanotubes-based Sensors: Definition of carbon nanotube; features of carbon nanotubes; synthesis of carbon nanotubes.

UNIT - V

Sensors Based on Nanostructures of Metal Oxide:
Synthesis of metal oxide structures by dry and wet methods; types of metal oxide gas sensors (0D, 1D, and 2D); defect chemistry of the metal oxide sensors; sensing mechanism of metal-oxide gas sensors; and porous metal-oxide structures for improved sensing applications.

Text Books :

1. Varghese Thomas and Balakrishna K M , Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, Atlantic Publishers and Distributers(P) Ltd, 2012.

2. G.Mohan Kumar, Nanotechnology: Nanomaterials and Nano devices, Narosa Publications,2016.

Reference Books :

1. T.Pradeep, Nano: The Essentials Understanding Nano Science and Nano Technology, Tata McGraw Hill, 2013.

. Richard Booker and earl Boyson, Nanotechnology: The Fun and Easy Way to Explore the Science of Matters Smallest Particle, Wiley Publications, 2011.

Web References:

1.https://nptel.ac.in/courses/118102003

2. online courses.nptel.ac.in/noc19_mm21/preview

3. online courses nptel.ac.in/noc22_ch11/preview

Question Paper Pattern:

Sessional Exam:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions and the student should answer any one question from each unit. Each Question carries 12 marks.

DISASTER MANAGEMENT (DM)								
VI Semester: B.Tech.						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC316	**Open Elective - II**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1.5Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the definitions and terminologies used in disaster management.

CO2: Understand the types and categories of disasters.

CO3: Understand the impact of disasters on socio-economic and environment.

CO4: Plan for disaster risk reduction, mitigation and management strategies.

CO5: Understand the relationship between development and disasters.

UNIT – I

Introduction: Concepts and definitions: disaster, hazard, vulnerability, risks, severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT - II

Disasters: Disasters classification

Natural Disasters: Floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.,

Manmade Disasters: Industrial pollution – Artificial flooding in urban areas –Nuclear radiation – Chemical spills – Transportation accidents – Terrorist strikes, etc. – Mountain and coastal areas.

UNIT – III

Disaster Impacts: Disaster impacts –Environmental, physical, social, ecological, economic, political, etc., Health - psycho-social issues – Demographic aspects–Hazard locations – Global and national disaster trends – Climate change and urban disasters.

UNIT – IV

Disaster Risk Reduction:

Disaster Management Cycle - its phases: Prevention, mitigation, preparedness, relief and recovery – Risk analysis, vulnerability and capacity assessment – Early warning systems.

Post-Disaster Environmental Response (i.e. water, sanitation, food safety, waste management, disease control, security, and communications)**:** Role and responsibilities of government, community, local institutions, NGOs and other stakeholders – Policies and legislation for disaster risk reduction – Activities of National Disaster Management Authority.

UNIT - V

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications – Sustainable and environmental friendly recovery – Reconstruction and development methods.

Text Books:

1. PradeepSahni, Disaster Risk Reduction in South Asia, PHI, New Delhi.
2. Ghosh G.K., Disaster Management, APH Publishing Corporation.
3. Singh B.K., Handbook of Disaster Management Techniques &Guidelines, Rajat Publication.
4. V. K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, Delhi,

Reference Books:

1. A Status Report Publication of the Govt. of India, Ministry of Home Affairs, National Disaster

Management Division, Disaster Management in India.
2. A. S. Arya, AnupKaranth, and Ankush Agarwal, Hazards, Disasters and Your Community; A Primer for Parliamentarians, GOI–UNDP Disaster Risk Management Programme.
3. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

Web References:

http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. www.odihpn.org,Disaster Preparedness Programme in India. A Cost Benefit Analysis, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.
4. www.empowerpoor.org, Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme. [2001–2008]

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

PROJECT MANAGEMENT (PM)

VI Semester: B.Tech.						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OEC317	Open Elective - II	3	0	-	3	40	60	100
Sessional Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the methods of planning, scheduling and principles of construction management.

CO2: Formulate, solve CPM and PERT networks.

CO3: Understand the structure of organization and resource allocation.

CO4: Understand the procedure for documentation of tenders, contracts & time-cost analysis.

CO5: Understand basics of engineering economics and solving of cash flow problems.

CO6: Understand the concepts of quality control and safety management.

UNIT – I

Introduction to Construction Management: Significance – Objectives and functions of construction management – Types – Resources – Stages – Team of construction unit.

Construction Planning and Scheduling: Objectives and importance of planning and Scheduling – Methods of planning and scheduling – Advantages and classification of schedules – Bar charts – Milestone charts.

UNIT - II

Network Techniques in Construction management: Elements of network – Network techniques – Breakdown structures – Representation and specifying of activities and events – Rules for Network.

Critical Path Method (CPM): Introduction – Difference between CPM and PERT – Time estimates – Float – Critical path – Network analysis and computation problems.

UNIT – III

Program Evaluation and Review Technique (PERT): Introduction, time estimates, slack, critical path – Network analysis and computation problems.

Cost–Time Analysis in Net Work Planning: Importance of time – Project cost analysis in network planning – Updating – Resources allocation.

UNIT – IV

Tenders and Contracts: Type of tenders – Principles of tendering – Notice inviting tender – Contracts definition – Essentials – Types – Documents – Conditions of contracts.

Arbitration: Definition – Arbitrator – Arbitration agreement – Qualification of arbitrator – Advantages of arbitration.

Organisation: Principles of organization – Types of organization – Measurement book.

UNIT - V

Engineering Economics: Basic Principles – Equivalence – Cash Flow diagram – Single Payment present worth factor – Uniform series present worth factor.

Safety, Inspection and Quality Control: Importance of safety – Safety Measures – Personal Protection Equipment – Need for inspection at work – Principles ofinspection – Importance of quality – Elements of quality – Organisation for quality control.

Text Books:

1. B.C. Punmia & K.K. Kandelwal, Project Planning & Control with PERT & CPM, Laxmi Publications (P) Ltd, New Delhi.

2. J.L. Sharma, Construction Management and Accounts, Satya Prakasan (P), New Delhi.

Reference Books:

1. U.K. Shrivastava, Construction planning and Management, Galgotia (P), New Delhi.
2. S. Seetha Raman, Construction Engineering and Management, Umesh (P), New Delhi.
3. Chitkara, Construction project management – Planning, Scheduling and Control, Tata McGraw Hill.
4. Halpin, D.W, Financial and Cost Concepts for Construction Management, John Wiley and Sons, New York.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weight age of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

ADVANCED INFORMATION SYSTEMS (AIS)								
VI Semester : B.Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC318	**Open Elective - II**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Demonstrate the Object oriented concepts.

CO2: Interpret different types of Inheritance and Polymorphism.

CO3: Classify layer functionalities of OSI reference model and TCP Protocol suite.

CO4: Summarize the concepts of internetworking, security and IP addressing.

CO5: Demonstrate different types of protocols and web contents used in web design

UNIT – I

Introduction to Object Oriented Concepts: Introduction, Programming Techniques, Introduction to Object Oriented Concepts, Concept of Structured Procedural Programming, Class, Object

Characteristics of Objects: Data Abstraction, Classification, Encapsulation and Message Passing. Access Specifiers in Class, UML Class Diagrams.

UNIT – II

Advanced Concepts in Object Oriented Technology: Relationships, Inheritance- Protected Access Specifier, Multiple and Multilevel Inheritance, Generalization and Specialization, Abstract classes, Polymorphism, Implementation of OOC through C++.

UNIT – III

Introduction to computer Networks: Introduction, Network Topology, OSI Reference Model, TCP Protocol Suite, Routing Devices, Types of Networks.

UNIT – IV

Internetworking: Protocols for Internetworking, Internet Address and Domains, Packets, Packet Switched Networks, Virtual Private Networks, and Working of Internet.

UNIT – V

Introduction to Web Technology: Introduction, Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Domain Name Server (DNS), Web Applications, Types of Web Content, Multi-Tier Web Applications, Performance of Web Applications.

Text Books:

1. Campus Connect Foundation Programme – Object Oriented Concepts – System
2. Campus Connect Foundation Programme – Computer Hardware and System Software - Vol. – 3, INFOSYS Concepts
3. Campus Connect Foundation Programme – Relational Database Management System, Client Server
4. E.Balaguruswamy, Object Oriented programming with C++, 2017
5. Data Communications & Networking, Forouzan, Tata McGrawHill, Fifth edition, 2017

Web References:

1. https://www.tutorialspoint.com/cplusplus/
2. https://www.geeksforgeeks.org/computer-network-tutorials/

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections

with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

PRODUCT LIFE CYCLE MANAGEMENT (PLM)								
VI Semester : B.Tech					**Scheme : 2020**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC319	**Open Elective - II**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1½ Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes: At the end of the course the student will be able to

CO1: Understand Product life cycle management process.

CO2: Understand different steps in Product development process.

CO3: Get knowledge on Product data management

CO4: Understand the implementation of PLM and its impact on the organization

CO5: Understand core functions of PLM and supply chain and ERP systems

UNIT – I

Organization Business Models **(**MTS, MTO, CTO, ETO Etc), Basics of Enterprise Systems (PLM, ERP, MES), Background, Overview, Need, Benefits, and Concept of Product Life Cycle, Components / Elements of PLM, Emergence of PLM, Significance of PLM, Differences between PLM and PDM

UNIT – II

Integrated Product development process-Conceive-Specification, Concept design, Design-Detailed design, Validation and analysis (Simulation), Tool design, Realize-Plan manufacturing, Manufacture, Build/Assemble, Test(quality check).

UNIT – III

Workflow Processes, Design Collaboration, Processes Management, Document Management, Visualization, Bill of Materials (BOM) Management – Lab exercises.

UNIT – IV

Engineering Change Control, Configuration Management, Manufacturing Process Management, Variant Management, Classification PLM Architecture, Various PLM tools, Data Modeling, Security management.

UNIT – V

CAD Integrations, Information authoring tools (e.g., MCAD, ECAD, Technical publishing), Core functions (e.g., data vaults), Data Flow to Other systems such as Supply chain and ERP systems. (4 hours for lab exercises)

Text Books

1. Grieves, Michael, Product Lifecycle Management, McGraw-Hill publishers.

2. Antti Saaksvuori, Anselmi Immonen, Product Life Cycle Management – Springer publications

Reference Books

1. Kari Ulrich and Steven D. Eppinger, Product Design & Development, McGraw Hill International

2. Burden, Rodger PDM: Product Data Management, Resource Publications.

Question Paper Pattern:

Sessional Exam:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

INDUSTRY 4.0 (I40)

VI Semester : B.Tech						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE320	**Open Elective - II**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the Characteristics, Sensors, Actuators and Communication models for industry 4.0.

CO2: Understand Fourth revolution and Industry operations.

CO3: Understand the Cyber-Physical Systems, Sensors, platforms of Industrial IoT.

CO4: Understand the Cyber security, Industrial Internet Systems.

CO5: Understand Business Models and Architecture, Key enablers in Industrial IoT.

UNIT – I

Introduction to IoT, Sensing and Actuators, Communication

Introduction, Transducer- Definition, Sensor – Static and Dynamic characteristics, Types, Actuator – Features, Types, Communication protocol, Standards, Features, Variants, IoT Networking - introduction, Proprietary non-IP based solution, IP based solutions.

UNIT - II

Industry 4.0: The Fourth Revolution

Introduction, Sustainability Assessment of Manufacturing Industry, Lean Production System, Smart and Connected Business Perspective, Smart Factories

UNIT – III

Cyber-Physical Systems, Sensors, Platforms

Cyber-Physical Systems and Next-Generation Sensors, Collaboration Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis.

UNIT - IV

Cyber security, Industrial Internet Systems:

Cyber security – Introduction, challenges, Industrial Internet Systems, Industrial Sensing & Actuation, Industrial Processes and systems.

UNIT - V

Business Models and Architecture, Key Enablers:

Industrial Business Models, Reference Architecture for Industrial Business Models of IIoT, Key Enablers of Industrial IoT in Sensing, Key Enablers of Industrial IoT in Connectivity, Key Enablers of Industrial IoT in Connectivity.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”, VPT; 1 edition.
2. Industrial IoT Challenges, Design Principles, Applications, and Security, Ismail Butun, Springer Nature Switzerland AG, 2020.
3. Industrial Internet of Things Technologies and Research Directions, Anand Sharma, Sunil Kumar Jangir, Manish Kumar, Dilip Kumar Choubey, Tarun Shrivastava,S. Balamurugan, CRC, Taylor & Francis Group, LLC, 2020.

Reference Books

1. Industrial IoT Application Architectures and Use Cases, A. Suresh, Malarvizhi Nandagopal, Pethuru Raj, E. A. Neeba, Jenn-Wei Lin, CRC Press, Taylor & Francis Group, 2020.
2. "Introduction to Industry 4.0 and Industrial Internet of Things", Prof. Sudip Misra, IIT kharagpur

Web References:

6. https://www.electricaltechnology.org/2016/07/internet-of-things-iot-and-its-applications-in-electrical-power-industry.html
7. http://www.nptelvideos.in/2012/11/internet-technologies.html

Question Paper Pattern:

Internal Assessment: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

MULTIMODAL TRANSPORTATION ENGINEERING (MTE)								
VII Semester : B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OEC401	**Open Elective - III**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to understand

CO1: the components of urban and rural roads and estimates the capacity and level of service

CO2: the components and functions of railway track

CO3: the control factors, gradients and geometric design of railway track

CO4: the various aircraft characteristics and design of runways

CO5: the various features in Harbours and Ports, their construction and coastal protection works

UNIT – I

Highway Engineering: Critical cross section of urban and rural roads- Road ecology-Classification of roads-Concept of Capacity and Level of Service-Factors affecting-Computation of Capacity and Level of Service as per Indo-HCM2017- Measure of effectiveness-Highway capacity and performance characteristics.

UNIT - II

Railway Track: Requirements of an ideal permanent way – Gauges in India – Selection of gauge- Functions and requirements of rails– Sleepers and Ballast- Functions and requirements, types of sleepers - Sleeper density – Ballast – Functions and requirements, types – Sub grade –
Functions of sub grade or formation – Sub grade materials and its improvement.

UNIT – III

Track Alignment: Basic requirements – Factors controlling alignment – Gradients – Types of gradient – Grade compensation on curves.
Geometric Design of the Track: Speed of the train – Speed on curves – Radius or degree of curvature – Super elevation or cant – Cant deficiency- negative super elevation - Types of transition curve – Length of transition curve –Widening of gauge on curves – Shift of the curve.

UNIT – IV

Airport Engineering: Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway-Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

UNIT - V

Harbour Engineering: Definition of Basic Terms: Harbour, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works.

Text Books

1. Indian Highway Capacity Manual- December2017, CSIR Publications, New Delhi.
2. C. Saxena and S.P. Arora [2015], Railway Engineering, Dhanpat Raj Publications
3. Khanna, S. K., Arora, M. G., and Jain, S. S. Airport planning and Design, Sixth Edition, Nem Chand and Bros, Roorkee, India, 2012.
4. C.Venkatramaiah., Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels.,Universities Press (India) Private Limited, Hyderabad, 2015.

Reference Books

1. Satish Chandra and M. Agrawal, Railway Engineering, Second Edition, Oxford University Press, 2013.

2. Rangwala, S.C. Railway Engineering, Charotar Publishing House, Anand, India, 2008.
3. Horonjeff, R., McKelvey, F. X., Sproule, W. J., and Young, S. B. Planning and Design of Airports, Fifth Edition, McGraw-Hill, New York, USA, 2010.

Web References:

1. https/www.coursera.org
2. www.nptel.ac.in/courses

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

AIR POLLUTION AND CONTROL (APC)								
VII Semester :B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OEC402	**Open Elective - III**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1 ½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: To take up the basic concepts of air pollution.

CO2: To introduce students to basic concepts of pollution.

CO3: The contents involved the knowledge of causes of air pollution.

CO4: The contents involved the knowledge of health related to air pollution.

CO5: To develop skills relevant to control of air pollution.

UNIT – I

Introduction: History of Air pollution and episodes –Sources of air pollution and types –Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile – Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise.

UNIT - II

Transport of Pollution in Atmosphere: Plume behavior under different atmospheric conditions – Mathematical models of dispersion of air pollutants –Plume behavior in valley and terrains –Plume behavior under different meteorological conditions –Concept of isoplates.

UNIT – III

Effects of Air Pollution: Effects of Air Pollution on human beings, plants and animals and Properties – Global Effects –Greenhouse effect –Ozone depletion, heat island, dust storms –Automobile pollution sources and control –Photochemical smog –Future engines and fuels.

UNIT – IV

Air Pollution control: Air Pollution control-at source – Equipment for control of air pollution –For particulate matter –Settling chambers–Fabric filters –Scrubbers –Cyclones Electrostatic precipitators, For Gaseous pollutants-control by absorption-adsorption scrubbers-secondary combustion after burners – Working principles advantages and disadvantages – Design criteria and examples.

UNIT – V

Air Quality Sampling and Monitoring: Stack sampling – Instrumentation and methods of analysis of SO2, CO etc, – Legislation for control of air pollution and automobile pollution.

Text Books:

1. C.S. Rao, Environmental Pollution Control Engineering, New Age International publishers.
2. H.S. Peavy, D.R. Row & G. Tchobanoglous, Environmental Engineering, McGraw Hill International Edition.
3. Martin Crawford, Air Pollution Control Theory, TMH Publication.

Reference Books:

1. H.C Parkins, Air Pollution and Control, McGraw Hill Publication.
2. Wark, K., Warner, C.F., and Davis, W.T., Air Pollution: Its Origin and Control, Addison-Wesley Longman. 1998.
3. Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), Air Pollution: Health and Environmental Impacts, CRC Press.
4. Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C., Fundamentals of Air Pollution, Academic Press.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

INDUSTRIAL ROBOTICS (IRT)

VII Semester: B. Tech						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC403	Open Elective - III	3	-	-	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration : 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic components of industrial robots.

CO2: Understand the types of End Effectors and Sensors in robots.

CO3: Understand the Robot manipulator, forward and inverse kinematics.

CO4: Understand the programming methods for robots and design considerations of Robot work cell

CO5: Understand the manufacturing and processing applications of robot.

UNIT – I

Fundamentals of Robotics and Robot technology: Automation and robotics, robot definition, robot anatomy, robot configurations, work volume, precession of movement, robot actuation and feed-back component, actuators, hydraulic actuators, electrical actuators (variable reluctance type and permanent magnet type stepper motor). Position sensors (potentiometer, resolvers, and encoders), velocity sensors (tachometer), power transmission devices.

UNIT – II

End Effectors and Sensors: Robot end effectors, types of end effectors, mechanical grippers, other type of grippers- Vacuum cups, magnetic grippers, adhesive grippers, Hooks, Scoops and other miscellaneous devices. Sensors in robotics- tactile sensors, proximity and range sensors, Machine Vision, use of sensors in robotics.

UNIT – III

Robot Motion Analysis and Control: Introduction to manipulator kinematics, position representation, forward transformation and reverse transformation of two degree freedom robot arm, three degree of freedom arm in two dimensions, four degree freedom manipulators in three dimension, homogeneous transformation and homogeneous transformation matrix.

UNIT – IV

Robot Programming: Methods of robot programming- Lead through- WAIT, SIGNAL and delay commands; The textual robot programming languages, robot language structures, constants, variables and other data objects, motion commands, end effectors, sensors commands and monitor mode commands.

Robot cell design and control: Robot cell layout, work cell control, interlocks, error detection and recovery, graphical simulation of robot work cell.

UNIT – V

Robot Applications in Manufacturing: Material transfer and machine loading and unloading general considerations in material handling.

Processing Operations: Spot welding, continuous arc welding, spray coating, and other processing operations.

Text Books

1. Mickel. P. Groover et. al, Industrial Robotics- Technology, Programming and Applications, McGraw Hill Publishers, New Delhi.
2. Deb S.R., Robotics Technology and Flexible Automation, TMH Publishers, New Delhi.
3. Richard D. Klafter, Robotic Engineering: An Integrated Approach, Pearson Publications.

Reference Books

1. K. S. Fu, Ralph C. Gonzalez and C.S.G. Lee, Robotics, control, sensing, vision, Mc Graw Hill.
2. Rama chandran, Nagarajan, Introduction to Industrial Robotics, Pearson.

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

QUALITY & RELIABILITY ENGINEERING (QRE)

VII Semester: **B. Tech** | **Scheme** : **2020**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 404	OEC-III	3	-	-	3	40	60	100

Sessional Exam Duration : 1.5 Hrs | **End Exam Duration : 3 Hrs**

Course Outcomes : At the end of the course students will be able to

- **CO1:** Understand the overview of the Total Quality Management system
- **CO2:** Understand concepts of customer satisfaction and employee involvement
- **CO3:** Apply the appropriate tools and techniques of continuous process improvement for controlling and improving quality
- **CO4:** Apply Quality Function Deployment and Bench Marking process for improving a product or process
- **CO5:** Understand concept of Reliability Engineering

UNIT – I

IntroductiontoT.Q.M.: Introduction to Quality; Evolution of and basic approach toTotal Quality Management;Leadershipconcepts;TheSevenhabitsofhighlyeffectivepeople;RoleofTQM Leaders; Implementation of TQM; Quality council, quality statements

UNIT – II

CustomerSatisfaction: TypesofCustomers-InternalandExternal;Customerperceptionofquality; Feedback & brief discussion on Information Collecting Tools
Employee Involvement: Maslow's hierarchy of needs; Types of Teams, Stages of team development, Common barriers to team progress, Training; Benefits of Employee Involvement

UNIT – III

ContinuousProcessImprovement: Introduction,Jurontrilogy,Improvementstrategies;P-D-S-A cycle & Problem solving method; Basic concepts of Kaizen and Six sigma quality control, Taguchi method, Quality circles
Supplier Partnership: Introduction, Partnering, Sourcing, Supplier Selection, Supplier Rating, Relationship Development
Tools & Techniques of TQM : Pareto diagram, Cause & Effect diagram

UNIT – IV

Benchmarking: Introduction, Benchmarking process
Quality Function Deployment: Benefits of QFD, House of Quality

UNIT – V

Reliability Engineering: Introduction, Failures & failure modes, Causes of failures
Design for Reliability: Designing for higher Reliability, Reliability & Cost
Component Reliability: MTTF, Time dependent hazard models – Exponential Distribution
System Reliability: Systems with components- in Series, and in Parallel; Non-Series-Parallel systems
Redundancy Techniques: Introduction, Component & Unit Redundancy, Weakest link technique

Text Books:

1. Dale H. Bester field, Total Quality Management, Pearson Education, New Delhi
2. E. Balagurusamy, Reliability Engineering, TMH Publishers, New Delhi

3. M. Mahajan, Statistical Quality Control, DhanapatRai and Sons Publishers, New Delhi

Reference Books:

1. Douglas C. Montgomery, Introduction to Quality Control, John Wiley and Sons Publishers, New
York

2. N. Logothetis, Managing for Total Quality, From Deming to Taguchi, PHI Publishers, New Delhi

3. L.S. Srinath, Reliability Engineering, East West Press, New Delhi

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

SMART GRID TECHNOLOGIES (SGT)

VII Semester : B.Tech | **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OEC405	OEC-III	3	0	0	3	40	60	100

Sessional Exam Duration : 1 ½ Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic concepts, components and architecture of smart grid.

CO2: Understand the various measurement technologies in smart grid.

CO3: Understand about battery technology and energy storage in smart grid.

CO4: Understand the Interoperability and control of power grid.

CO5: Understand the cyber security issues in smart grid.

UNIT – I

Introduction:

Today's Gird versus Smart Grid, Rationale for smart Grid, Computational Intelligence, Power System Enhancement, Communication and Standards, Environment and Economics, Shareholders Roles and Function, Architecture, Functions of Components.

UNIT - II

Sensors and Measurement:

Sensors for Smart Grid, Monitoring and Measurement Technologies, PMU, Smart meters, Smart Appliances, Multi Agent Systems (MAS) Technology, Micro grid and Smart grid comparison, Wide Area Monitoring Protection and Control and SCADA.

UNIT – III

Energy Storage:

Batteries, Flow Batteries, Fuel Cell and hydrogen electrolytes, Flywheel, Super conduction magnetic energy storage systems, super capacitors, Simulation and case studies

UNIT - IV

Interoperability:

Introduction - State-of-the-Art-Interoperability - Benefits and Challenges of Interoperability- Model for Interoperability in the Smart Grid Environment - Smart Grid Network Interoperability - Interoperability and Control of the Power Grid, Standards - Approach to Smart Grid Interoperability Standards

UNIT - V

Smart Grid Cyber Security:

Cyber Security State of the Art- Cyber Security Risks - Cyber Security Concerns Associated with AMI-Mitigation Approach to Cyber Security Risks - Cyber Security and Possible Operation for Improving - Methodology for Other Users

Text Books

1. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc, IEEE press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons Inc, 2012.
3. Lars.T.Berger, K.Iniewski, "Smart Grid: Applications, Communications & Security" Wiley India Pvt. Ltd, Reprint 2015.

Reference Books

1. Fereidoon P. Sioshansi, "Smart Grid: Integrating Renewable, Distributed & Efficient Energy",

Academic Press, 2012.
2. Clark W.Gellings, “The smart grid: Enabling energy efficiency and demand response”, Fairmont Press Inc,2009.
3. Qi Huang, Shi Jing “Innovative Testing and Measurement Solutions for Smart Grid”, John Wiley & Sons Inc, 2015.

Web References:

1. https://onlinecourses.nptel.ac.in/noc18_ee42/preview
2. https://www.smartgrid.gov/the_smart_grid/smart_grid.html
3. https://www.coursera.org/lecture/electric-power-systems/smart-grid-the-environment-aH8g0

Question Paper Pattern:

Sessional Examination: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI & ML)								
VII - Semester: B. Tech							**Scheme:2020**	
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC 406	**Open Elective - III**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1 ½ Hrs						**End Exam Duration:3 Hrs**		

Course Outcomes: At the end of the course students will be able to

CO1:.Recognize how foundations laid for Artificial Intelligence

CO2: Analyze the search strategies to find solutions to the problems by systematically generating new states

CO3: Understand the machine learning concepts and the main steps in a typical machine learning

CO4: Design a digit image classifier on MNIST dataset

CO5: Analyze various ML training models

UNIT–I

Introduction: What Is AI? The Foundations of Artificial Intelligence

Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, And the Structure of Agents.

UNIT–II

Uninformed Search Strategies: BFS, DFS, Depth –limited search, IDA, Bidirectional search

Informed (Heuristic) Search Strategies- Greedy best-first search, A* search, Memory-bounded heuristic search, Learning to search better. Heuristic Functions.

UNIT–III

Machine Learning

Introduction, Types of Machine Learning Systems, Challenges, Testing and Validating.

UNIT–IV

Classification, Training a Binary Classifier, Performance measures, Multiclass classification, Error analysis, Multi label classification, Multi output classification

End-to-End Machine Learning Project :

Working with Real data, Launch, Monitor and Maintain your system

UNIT–V

Training Models Linear Regression, Gradient Descent, Polynomial Regression, Learning Curves, Regularized Linear Models, Logistic Regression

Text Books:

1.Stuart Russell and Peter Norvig, “Artificial Intelligence:A Modern Approach”,Third Edition,2010.Pearson Education.

2. Aurelian Geron,“Hands-On Machine Learning with Scikit-Learn and Tensor Flow:Concepts,Tools,and Techniques to build Intelligent Systems”,OReilly Publications,First Edition, 2017

Reference Books:

1.Elaine Richie Kevin Knight[2008],[3rdEdition],Artificial Intelligence,TMH

2. Oliver Theobald,“Machine Learning for Absolute Beginners”,Second Edition,2017

3. Miroslav Kubat, “An Introduction to Machine Learning” , Springer, 2017

Web References:

1.https://onlinecourses.nptel.ac.in/noc18_cs51

2.https://www.geeksforgeeks.org/F-intelligence-an-introduction/

3. https://www.coursera.org/learn/python-machine-learning offered by University of Michigan

4. https://github.com/ageron/handson-ml.

Question Paper Pattern:

Sessional Exam

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. and the student should answer any one question from each unit. Each Question carries 12 marks.

DISTRIBUTED EMBEDDED SYSTEMS (DES)

VII - Semester : B. Tech | **Scheme: 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 407	Open Elective - III	3	-	-	3	40	60	100

Sessional Exam Duration: 1 ½ Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the real time environment and applications.

CO2: Understand System architecture and design of Distributed Embedded Systems

CO3: Understand inter task management and scheduling.

CO4: Analyze the network connection of distributed systems

CO5: Analyze the working of multiple embedded devices in a distributed network

UNIT-I

Real Time Environment: Real-time computer system requirements, classification of real time systems, functional requirements, temporal requirements, global time, examples of real time systems.

UNIT-II

Distributed System Design: Need of distributed systems, System Architecture, compatibility, scalability and dependability.

UNIT-III

System Scheduling: Inter component communication, task management, and dual role of time; inter task interactions, Scheduling problem - static & dynamic scheduling – system design – validation – time–triggered architecture.

UNIT-IV

Distributed Networks: Types of networks, comparisons, ISO-OSI model, TCP/IP connections. CAN concepts, Ethernet

UNIT-V

Case Studies: Bluetooth controlled embedded operations, GSM based embedded operations, and event trigger based embedded applications.

Text Books:

1. Hermann Kopetz, Real–Time systems – Design Principles for distributed Embedded Applications, 2nd Edition, Springer 2011.

2. GlafP.Feiffer, Andrew Ayre and Christian Keyold, Embedded Networking with CAN and CAN open, Copperhill Media Corporation, 2008.

Reference Books:

1. Bernd Kleinjohann, Architecture and Design of Distributed Embedded Systems, Springer US,2013

1. Wayne Wolf, "Computers as Components", Second edition, Morgan Kaufmann, 2008.

Web References:

1.https://www.coursera.org/specializations/real-time-embedded-systems

2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of

three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions. and the student should answer any one question from each unit. Each Question carries 12 marks.

NATURAL LANGUAGE PROCESSING (NLP)

VI Semester : B. Tech | **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 408	Open Elective - III	3	0	0	3	40	60	100

Sessional Exam Duration: 1½ Hrs | **End Exam Duration: 3 Hrs**

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the importance of Text Wrangling, Cleansing and POS tagging.

CO2: Develop a NLP application using the NLTK library.

CO3: Implement Text classification algorithms using scikit-learn and NLTK.

CO4: Understand the basics of Tokenizing text using WordNet.

CO5: Understand the importance of Text feature extraction process.

UNIT – I

Introduction to Natural Language Processing: Why learn NLP, Diving into NLTK, Text Wrangling and Cleansing, Sentence splitter, Tokenization, Stemming, Lemmatization, Stop word removal, Rare word removal, Spell correction, POS tagging, Named Entity Recognition (NER).

UNIT – II

NLP Applications: Building your first NLP application, Other NLP applications – Machine translation, Information retrieval, Speech recognition, Text classification, Information extraction.

UNIT – III

Text Classification: Machine Learning, Text classification, Sampling – Naïve Bayes, Decision trees, Stochastic gradient descent, Logistic regression, Support Vector Machines, The Random forest algorithm, Text clustering – K-Means.

UNIT – IV

Tokenizing Text and WordNet Basics: Introduction, Tokenizing text into sentences, Tokenizing sentences into words, Tokenizing sentences using regular expressions, Training a sentence tokenizer, Filtering stop words in a tokenized sentence, Looking up Synsets for a word in WordNet, Looking up lemmas and synonyms in the WordNet, Calculating WordNet Synset similarity, Discovering word collocations.

UNIT – V

Feature Extraction: Bag of words feature extraction, Training a Naïve Bayes classifier, Training a Decision tree classifier, Training a maximum entropy classifier, Training scikit-learn classifiers, Measuring precision and recall of a classifier, Training a classifier with NLTK-Trainer.

Text Books:

1. Natural Language Processing: Python and NLTK, Deepti Chopra, Jacob Perkins, and Nitin Hardeniya by Packt 2016.
2. Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems, Bodhisattwa Majumder, Anuj Gupta, Sowmya Vajjala, Harshit Surana published by O'Reily Media, Inc, 2020.

Reference Books:

1. Daniel Jurafsky & James H. Martin, Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition, 2nd Edition, Pearson Education, 2009.
2. Tanvier Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford Higher Education, 2008.

3. Daniel M. Bikel & Imed Zitouni, Multilingual Natural Language Processing Applications: From Theory to Practice, Pearson Publication, 2012.
4. Christopher D. Manning, and Hinrich Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Web References:

3. https://www.coursera.org/specializations/natural-language-processing
4. https://www.udemy.com/course/speech-recognition-a-z-with-hands-onlearnkarts/
5. https://nptel.ac.in/courses/106105158

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

DESIGN THINKING (DTH)								
VII Semester : B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC 409	**Open Elective - III**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Recognize the importance of Design Thinking

CO2: Identify the steps in Design Thinking process

CO3: Identify the difference between creativity and innovation

CO4 : Evaluate the value of creativity

CO5: Formulate specific problem statements of real time issues

UNIT – I

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry

UNIT – II

Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

UNIT – III

Innovation: Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

UNIT – IV

Product Design: Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

UNIT – V

Design Thinking in Business Processes: Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Text Books:

1.Change by design, Tim Brown, Harper Bollins (2009)

2.. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons

Reference Books:

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Rod Judkins, The Art of Creative Thinking, Rod Judkins, Hodder & Stoughton
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough. H

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections

with Two Questions (EITHER/OR Type) in each section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

CLOUD, MICRO SERVICES & APPLICATION (CMSA)

VII Semester: B. Tech | **Scheme:2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 410	Open Elective - III	3	0	-	3	40	60	100

Sessional Exam Duration: 1½ Hrs | **EndExamDuration:3 Hrs**

Course Outcomes: At the end of the course students will be able to

CO1: Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and

CO2: Develop and design an application using various tools in cloud environment.

CO3: Acquire the basic and important design concepts an disuse of web application development

CO4: Structure simple python program for developing an application in cloud.

CO5: Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide

UNIT– I

Cloud Fundamentals-Cloud Service Components-Cloud Service, Deployment Models-Cloud components-

UNIT– II

ApplicationArchitectures-Monolithic&Distributed,MicroserviceFundamentalandDesignApproach-

UNIT–III

Devops fundamentals - Devops Role and Responsibility-Tools and Applications- Containerization Process

UNIT– IV

Cloud Security-Cloud Security Shared Responsibility Architecture-Security By Design Principles-Identity

UNIT– V

Developing and Deploying an Application in the Cloud- Building a python project based on Design-

TextBooks :

1. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, “Cloud ComputingConcepts, Technology
2. GuoNingLiu, Qiang GuoTong, Harm Sluiman,AlexAmies,"Developing and Hosting Applications on the
3. KaiHwang,GeofferyC.FoxandJackJ.Dongarra,“Distributed and Cloud Computing: Clusters, Grids,
4. Rajkumar Buyya ,James Broberg Andrzej M.Goscinski , “Cloud Computing: Principles and

Reference Books

1. Michael J. Kavis “Architecting the Cloud: Design Decisions for Cloud Computing Service Models
2. AzureVirtual Machineshttps://docs.microsoft.com/enus/azure/virtualmachines/
3. GoogleApp Enginehttps://cloud.google.com/appengine#allfeatures
4. GoogleKubernetesEnginehttps://cloud.google.com/kubernetesengine#allfeatures
5. DockerTutorial:https://dockercurriculum.com

Question Paper Pattern

Sessional Exam

BLOCK CHAIN TECHNOLOGIES (BCT)

VII Semester : B.Tech | **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC411	Open Elective - III	3	0	0	3	40	60	100

Sessional Exam Duration 1½ Hrs | **End Exam Duration:** 3 Hrs

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the basic concepts of Blockchain technology.

CO2: Interpret the security and risks involved in Blockchain applications.

CO3: Interpret the types of Blockchain applications and Blockchain solutions.

CO4: Understand the process of Ethereum Blockchain Implementation

CO5: Understand the process of Hyper ledger Blockchain Implementation

UNIT – I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain : Evolution of Computer Applications, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain. Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT – II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT – III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications

UNIT – IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet

UNIT – V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Text Books:

1. Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley
2. Andreas M. Antonpoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

Reference Books:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill

2. Mastering Bitcoin: Programming the Open Blockchain, 2nd ed., Antonopoulos, O'Reilly, 2017. ISBN: 978
3. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Web Resources:

1. NPTEL online course : https://nptel.ac.in/courses/106/104/106104220/#
2. Udemy: https://www.udemy.com/course/build-your-blockchain-az/

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

AGILE METHODOLOGIES (AM)								
VII Semester : B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC 412	**Open Elective - III**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the importance of interacting with business stakeholders in determining the requirements for a software system

CO2: Analyze iterative software development processes: how to plan them, how to execute them.

CO3: Identify the impact of social aspects on software development success.

CO4: Understand Software process improvement as an ongoing task for development teams.

CO5: Analyze the Agile Metrics and Quality Assurance Activities

UNIT – I

AGILE METHODOLOGY: Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT – II

AGILE PROCESSES: Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT – III

AGILITY AND KNOWLEDGE MANAGEMENT: Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT – IV

AGILITY AND REQUIREMENTS ENGINEERING: Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT – V

AGILITY AND QUALITY ASSURANCE: Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

Text Books:

1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

Reference Books:

1. Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.

2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

AUGMENTED REALITY & VIRTUAL REALITY (ARVR)								
VII Semester : B. Tech					**Scheme : 2020**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC 413	**Open Elective - III**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes : At the end of the course the student will be able to

CO1: Explore the history of spatial computing and design interactions

CO2: Understand the foundational principles describing how hardware, computer vision algorithms function

CO3: Learn Virtual reality animation and 3D Art optimization.

CO4: Demonstrate Virtual reality

CO5: Introduce to the design of visualization tools

UNIT – I

Designing and Art Across Digital Realities: Introduction, Modalities, Types of common HCI modalities, New Modalities, The current state of modalities for spatial computing Devices, current controllers for immersive computing systems, Voice, Hands and Hardware inputs over the next generation.

Designing for our senses, not our devices: Envisioning a future, sensory technology, The Role of women in AI, Sensory Design, Five sensory Principles, Adobes' AR .

UNIT – II

Virtual Reality of Art: A more natural way of making 3D art, VR for animation

3D Art Optimization: Introduction, Draw Calls, Using VR Tools for creating 3D Art, Acquiring 3D Models Versus Making them from scratch.

UNIT – III

Computer vision that makes augmented reality Possible works: History of AR, How and why to select an AR Platform, Mapping, platforms, other Development considerations, The AR Cloud

Virtual Reality and Augmented Reality – cross- platform theory: Why cross platform, The role of game engines, understanding 3D Graphics, Portability lessons from video game design, simplifying the controller input.

UNIT – IV

Virtual Reality Toolkit: What is VRTK, History, Steam VR Unity Toolkit, VRTK v4, future of VRTK, success of VRTK

Three Virtual Reality and Augmented Reality Development Best Practices: Handling Locomotion, Locomotion in VR, Locomotion in AR, Effective use of Audio, Audio in VR, Audio in AR, Common interaction paradigms, Inventory of VR, Augmented Reality Raycasts

UNIT – V

Data and Machine learning visualization Design and Development in spatial computing: Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data visualization vs 3D data visualization in spatial computing, interactivity in data visualizations and in spatial computing, animation, failures in data visualization, good data visualization design optimize 3D spaces, data representations, info graphics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.

Character AI and Behaviors: Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

Text Books:

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, "Creating Augmented & Virtual Realities", 1st edition, O'REILLY, 2019.

Reference Books:

1. Steve Aukstakalnis, "Practical Augmented Reality", Pearson Education, 2017

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

COMPOSITE MATERIALS (CM)

VII Semester: B. Tech | **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 414	Open Elective - IV	3	0	0	3	40	60	100

Sessional Exam Duration : 1 ½ Hrs | **End Exam Duration : 3 Hrs**

Course Outcomes : At the end of the course the student will be able to

CO1: Identify the properties of fiber and matrix materials used in commercial composites, and its manufacturing techniques.

CO2: Understand manufacturing methods and their elastic properties of lamina.

CO3: Analyze the Hooke's law for different type of materials.

CO4: Understand the elastic behavior of the unidirectional composite

CO5: Analyze a laminated plate in bending, including finding laminate properties from lamina.

UNIT – I

Basic Concepts and Characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.
Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites

UNIT – II

Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM.
Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties

UNIT – III

Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation.

UNIT – IV

Elastic behaviour of Unidirectional Composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

UNIT – V

Analysis of laminated composite plates: Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory.

Text Books

1. R.M.Jones, Mechanics of Composite Materials Mc Graw Hill Company, New York.
2. Isaac and M.Daniel, Engineering Mechanics of Composite Materials, Oxford University Press.
3. Madhujit Mukhopadadhyay, Mechanics of composite materials and structures, Universities Press

Reference Books

1. L. R. Calcote, Analysis of Laminated Composite Structures ,Van Nostrand Rainfold
2. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley Interscience, New York

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

IMAGE PROCESSING (IP)

VII Semester : B. Tech						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OEC 415	Open Elective - IV	3	0	0	3	40	60	100
Sessional Exam Duration : 1 ½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the concepts of image processing system and various operations that can perform on digital images.

CO2: Understand the image enhancement in spatial and frequency domain.

CO3: Understand various image restoration techniques.

CO4: Understand various image compression and segmentation techniques.

CO5: Understand the various mathematical transforms, color image concepts and processing.

UNIT – I

Basic Concepts Definition, Applications of Digital Image Processing, Fundamental Steps, Components of Image Processing System, Human Visual System, Simple Image Formation Model, Image Sampling And Quantization, Spatial and Gray Level Resolution, Image Interpolation, Some Basic Relationships Between Pixels, Linear And Non Linear Operations.

UNIT - II

Image Enhancement

Spatial Domain: Basic Gray Level Transformations, Histogram Processing, Enhancement Using Logical And Arithmetic Operations, Image Subtraction, Image Averaging, Basic of Spatial Filtering, Smoothing And Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Frequency Domain: Introduction to Fourier Transforms, Basics of Filtering in Frequency Domain, Fundamental Steps in Filtering in Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

UNIT – III

Image Restoration Model of Image Degradation/Restoration Model, Noise Models, Restoration In Presence of Noise Only-Spatial Filtering, Adaptive Filters, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position Invariant Derivations, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.

UNIT - IV

Image Compression File format (bmp, tiff, pcx, gif, jpeg.), Compression fundamentals, Image Compression Models, Error Free Compression: VLC, Arithmetic Coding, LZW coding, Bit plane Coding, Lossless Predictive Coding, Lossy Compression: Lossy Predictive Coding, Block Transform coding

Image Segmentation Fundamentals, Detection of Discontinuities: Point, Line, Edge detection, Edge Linking and Boundary Detection: Local Processing, Global Processing via Hough Transform.

UNIT - V

Image Transforms Introduction One and Two Dimensional Discrete Fourier Transform (DFT), Properties of DFT, Properties of Discrete cosine and sine transforms, Properties of Slant, KL transforms.

Color Image Processing Color fundamentals, Color models: RGB, CMY and CMYK, HSI, Converting colors, RGB to HIS, HIS to RGB manipulating HIS component images, Pseudo color Image Processing, Full Color Image Processing.

Text Books

1. Rafael Gonzalez & Richard Woods, ―Digital Image Processing‖, 3rd Edition. Pearson publications, 2012

2. Anil K. Jain, —Fundamental of Digital Image Processing‖, PHI publication, 2013.
3. S. Jayaraman, S. Esakkirajan & T. Veera Kumar, —Digital Image Processing‖, Mc. Graw Hill, 2011.

Reference Books

1. Pratt, —Digital Image Processing‖, 2nd Edition, Wiley Publication, 1991.
2. S. Sridhar, —Digital Image Processing‖, Oxford University Press, 2011.

Web References:

1. https://nptel.ac.in/courses/117105079/
2. https://nptel.ac.in/courses/117104069/
3. https://nptel.ac.in/courses/106105032/

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

MOBILE COMPUTING (MC)

VII Semester : B. Tech						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC 416	**Open Elective - IV**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: To learn about the mobile infrastructure, radio resource management, overview of generation 1G to 5G

CO2: To illustrate the location management involved in GSM, Mobile IP.

CO3: To illustrate the transmission, transaction technology involved in mobile.

CO4: To explore the wireless network in mobile.

CO5: To discover the cognitive radio networks in mobile

UNIT – I

Introduction Overview of wireless and mobile infrastructure, Preliminary concepts on cellular architecture, Design objectives and performance issues, Radio resource management and interface, Propagation and path loss models, Channel interference and frequency reuse, Cell splitting, Channel assignment strategies, Overview of generations:- 1G to 5G

UNIT – II

Location And Handoff Management Introduction to location management (HLR and VLR), Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based), Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community based group mobility model), Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based), Terminal Paging (Simultaneous paging, Sequential paging), Location management and Mobile IP, Overview of handoff process, Factors affecting handoffs and performance evaluation metrics, Handoff strategies, Different types of handoffs (soft, hard, horizontal, vertical).

UNIT – III

Wireless Transmission Fundamentals Introduction to narrow and wideband systems, Spread spectrum, Frequency hopping, Introduction to MIMO, MIMO Channel Capacity and diversity gain, Introduction to OFDM, MIMO-OFDM system, Multiple access control (FDMA, TDMA, CDMA, SDMA), Wireless local area network, Wireless personal area network (Bluetooth and zigbee).

UNIT – IV

Wireless Network Mobile Ad-hoc networks - Characteristics and applications; Coverage and connectivity problems, Routing in MANETs, Wireless sensor networks - Concepts, basic architecture, design objectives and applications; Sensing and communication range, Coverage and connectivity, Sensor placement, Data relaying and aggregation, Energy consumption, Clustering of sensors, Energy efficient Routing (LEACH).

UNIT – V

Cognitive Radio Networks Fixed and dynamic spectrum access, Direct and indirect spectrum sensing, Spectrum sharing, Interoperability and coexistence issues, Applications of cognitive radio networks, Introduction to D2D communications-High level requirements for 5G architecture, Introduction to the radio resource management, power control and mode selection problems, Millimeter wave communication in 5G.

Text Books:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson, 2004.
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005

Reference Books:

1. Theodore Rappaport, “Wireless Communications: Principles and Practice”, Pearson Education, 2014.
2. Ezio Biglieri, MIMO, “Wireless Communications”, Cambridge University Press, 2009.
3. Ivan Stojmenovic, “Handbook of Wireless Networking and Mobile Computin”, Wiley, 2002.
4. James Cowling, “Dynamic Location Management in Heterogeneous Cellular Networks”, 2004.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

ENTERPRISE SYSTEMS (ES)

VII Semester : B. Tech						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC 417	**Open Elective - IV**	**3**	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand basic elements of Enterprise Systems

CO2: Develop skills in understanding architecture

CO3: Understand the application patterns

CO4: Understand the integration and patterns

CO5: Analyze the deployment

UNIT – I

Introduction to Modern Enterprise Systems: Introduction to enterprise systems. Elements of enterprise systems – Business Information system, Decision support systems, Knowledge management systems, Financial and human resource systems. Kinds of Enterprise systems- B2C and B2B models.

Components of Enterprise systems: Channels (Mobile, web, desktop, partner integration), Data management, workflow, Controlling and Auditing, Accounting etc.

UNIT – II

Key characteristics Enterprise systems: Distributivity, Managed redundancy, Exception processing, Collaboration, Data transformation.

Enterprise System architectures: Batch processing, Monolithic, client server, ecommerce, service oriented, micro service, and cloud architectures.

UNIT – III

Introduction to Enterprise Application architectures: Layer Architecture, Event driven Architecture, Service oriented Architecture, Micro service architecture, Plug-in architecture.

Application architecture Patterns: Layering, Organizing domain logic, Mapping to database, Web Presentation, Concurrency.

UNIT – IV

Enterprise Application Integration: Introduction to Enterprise Integration, different integration styles. Elements of messaging-based Integration.

Enterprise Integration patterns: Modern service integration techniques. Introduction to WSDL, SOAP. Introduction RESTFul webservices integration. Differences between SOAP and REST.

UNIT – V

Deployment of Enterprise applications: Key requirements in deployment - Stability, capacity, Security, availability, Network, Availability, and Transparency (Basic Introduction only).

Introduction to Enterprise Architecture: Importance of Enterprise Architecture. Enterprise architecture models. Zachman Framework, TOGAF Framework.

Text Books:

1. Ralph Stair, George Reynold, “Principle of Information Systems”, 10 ed.
2. Martin Fowler et al, “Pattern of Enterprise Application Architecture”, Addison-Wesley, 2012
3. Gregor Hohpe, Bobby Woolf, Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions,

Reference Books:

1. Mark Richards, Software Architecture patterns, 2015, O'Reilly.
2. Sam Newman, "Building Microservices", 2015,O'Reilly.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

MODERN WEB APPLICATIONS (MWA)								
VI Semester : B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC 418	**Open Elective - IV**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the various steps to design static websites.

CO2: Develop a Web Page using the HTML5.

CO3: Apply CSS effectively to create interactive websites.

CO4: Implement client-side scripting using JavaScript to design dynamic websites.

CO5: Develop end to end application - web frontend and backend development.

UNIT – I

Introduction to Internet & World Wide Web: Concept of website, its need and purpose, Types of websites: Static and dynamic website, Web Browsers, − Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services, Introduction to HTML, XML, JSON

UNIT – II

Hyper Text Mark Up Language: - Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms

UNIT – III

Cascading Style Sheets (CSS3): Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images

UNIT – IV

Java Script: Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue

UNIT – V

Front End Framework: Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX ; Introduction to Bootstrap – Basics, Grids, Themes ; Angular JS – Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation

Back End Technologies: Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE)

Text Books:

1. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
2. HTML5 Black Book,2nd Edition, Dreamtech Press,2016.
3. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons
4. RESTful Web Services: Leonard Richardson, Sam Ruby, May 2007

Reference Books:

1 Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.

2 Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development,2018

3 Jeffrey C and Jackson, ―Web Technologies A Computer Science PerspectivePearsonEducation, 2011.

4. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

Web References:
1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3.Bootstrap - CSS Framework: https://getbootstrap.com
4. https://docs.angularjs.org/api/ng/function/angular.element
Question Paper Pattern:
Sessional Examination: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section. **End Examination:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

COGNITIVE RADIO (CR)

VII - Semester: B. Tech						Scheme:2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 419	Open Elective - IV	3	-	-	3	40	60	100
SessionalExamDuration:1 ½ Hrs.						End Exam Duration: 3 Hrs.		

Course Out comes: At the end of the course the student will be able to

CO1: Understand the architecture of SDR and management of unlicensed spectrum.

C02: Analyze the Aware and Adaptive cognitive radios.

CO3: Analyze the spectrum awareness and interference avoidance

CO4: Understand technical challenges in CR and various spectrum sensing methods.

CO5: Analyze the OFDM based Cognitive radio and MIMO-OFDM channel estimation

UNIT-I

Software defined Radio: Basic SDR – Software and Hardware Architecture of an SDR – Spectrum Management – Managing unlicensed spectrum–Noise Aggregation-Component development–Wave form development– Cognitive wave form development

UNIT-II

Cognitive Radio Technology: Introduction–Radioflexibilityandcapability–Aware–Adaptive–Comparison of Radio capabilities and Properties–Available Technologies–IEEE 802 Cognitive Radio related activities.

UNIT-III

Spectrum Awareness:
Introduction,TheInterferenceavoidanceproblem,CognitiveRadioRole,Spectralfootprintminimization, Creating Spectrum Awareness-Spectrum usage reporting, Spectrum sensing, Potential Interference analysis, Distributed sensing and operation, Channel awareness and multiple signals in space

UNIT–IV

Cognitive Radio technical challenges and spectrum sensing:
Design Challenges associated with CR -Hardware requirements-Hidden primary user problem-Detecting spread spectrum primary users-Sensing duration and frequency-Security.

UNIT–V

Spectrum sensing
Spectrum sensing overview – Classification - Matched filter – waveform based sensing – cyclo-stationary based sensing –Energy detector based sensing –Radio Identifier– Cooperative sensing-other sensing methods.

Text Books:

1.BruceA.Fetti,-Cognitive Radiotechnology", 1st Edition,Elsevier.
2.H.Arslan-CognitiveRadio,SDRandAdaptiveWirelessSystems|,Springer,2007.

References:

1. K.C.Chen, R.Prasad , —Cognitive Radio Networks‖ , Wiley, 2009.
2. J. H. Reed, —Software Radio‖, Pearson, 2004.
3. Paul Burns, —Software defined radio for 3G‖, Artech House, 2003.

Web References:

1.https://nptel.ac.in/courses/108107107/3
2.https://www.youtube.com/watch?v=hzxgDyXbpt4
3.https://www.youtube.com/watch?v=z-E5jIoUFbA

Question Paper Pattern:

Sessional Exam:
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ORType)ineachsection.Thestudentshallansweronequestionfromeachsection.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions.andthestudentshouldansweranyonequestionfromeachunit.EachQuestioncarries12marks.

AUTOMATION & CONTROL (AMC)								
VII Semester : B. Tech					**Scheme : 2020**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
OEC 420	**Open Elective - IV**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Sessional Exam Duration : 1 ½ Hrs					**End Exam Duration: 3 Hrs**			

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the elements of automation principles

CO2: Understand the construction and working of pneumatic systems

CO3: Understand the working of hydraulic systems

CO4: Understand various control techniques in automation

CO5: Understand the automated testing and inspection methods in industry

UNIT - I

Automation in Manufacturing Industries: Introduction- Automation in production system, Principles and strategies of automation, Basic elements of an automated system, Advanced automation functions, Levels of automations, Automated flow lines and transfer mechanisms, Analysis of transfer lines without storage, Automated flow lines with storage buffers.

UNIT - II

Pneumatic Systems: Introduction to pneumatic systems: advantages and limitations, applications, structure and signal flow of pneumatic systems; pneumatic power pack: air generation and distribution, air reservoir, constructional details and working of filter, lubricator, pressure regulator, actuators, direction control valves, check valves, flow control valves, pneumatic counter.

Symbols of pneumatic valves, traverse time diagram, design of manually operated circuits: direct and indirect control of actuators, control of single and multiple actuators.

UNIT - III

Introduction to Hydraulic systems: Advantages and limitations, physical principles of oil hydraulics, hydraulic power pack, hydraulic fluids, filters, types of hydraulic pumps, pump performance calculations, hose size calculations, hydraulic actuators and accessories, accumulator, hydraulic valves, pressure control valves, flow control valves, open-center and closed-center hydraulic systems.

UNIT - IV

Control Technologies in Automation: Industrial Control Systems, Process Industries Verses Discrete-Manufacturing Industries, Continuous Verses Discrete Control, Computer Process Control and its Forms. Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation System: LAN, Analog & Digital I/O Modules, SCADA System & RTU.

UNIT - V

Automated Inspection and Testing: Inspection and testing, Statistical Quality Control, Automated Inspection Principles and Methods, Sensor Technologies for Automated Inspection, Coordinate Measuring machines, Other Contact Inspection Methods, Machine Vision, Other optical Inspection Methods.

Text Books :

1. Mikell-P.-Groover “Automation-Production-Systems-and-Computer-Integrated-Manufacturing”-Ed-4-2015, Pearson publishers
2. Majumdar S.R., “Pneumatic Systems Principles and Maintenance”, Tata McGraw Hill, New Delhi.
3. Peter Croser and Frank Ebel, "Pneumatics Basic Level TP 101" Festo Didactic GMBH & Co, Germany.
4. Hasebrink J.P. and Kobler R., “Fundamentals of Pneumatic Control Engineering”, Festo Didactic GMBH & Co, Germany.

5. Krishna Kant “Computer Based Industrial Control” -PHI
6. Groover M. P., "Industrial Robotics, Technology, Programming and Application", McGraw Hill Book and Co., 2012.

Reference Books :

1. Merkle D.,Schrader B. and Thomes M., "Hydraulics Basic Level TP 501" Festo Didactic GMBH & Co, Germany.
2. Peter Rohner, “Industrial Hydraulic Control” John Wiley and Sons, Brisbane
3. Tiess Chiu Chang & Richard A. Wysk “An Introduction to Automated Process Planning Systems”
4. Amber G.H & P.S. Amber “Anatomy of Automation” PrenticeHall
5. Srinivas Medida, "Pocket Guide on Industrial Automation", First Edition, IDC Technologies, 2008

Web References:

1. https://www.electrical4u.com/industrial-automation/
2. https://conceptsystemsinc.com/what-is-industrial-automation-types-of-industrial-automation
3. https://www.thomasnet.com/articles/automation-electronics/general-automation-systems

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Exam: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

HUMAN RESOURCE MANAGEMENT (HRM)

VII Semester : B. Tech						Scheme : 2020		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC 421	**Open Elective - IV**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand human resource management concept and challenges

CO2: Understand human resource system design

CO3: Understand Functional Areas of HRM

CO4: Understand human resource planning

CO5: Understand human resource management in Service Sector

UNIT – I

HUMAN RESOURCE MANAGEMENT: Concept And Challenges: Human Resources Management – Meaning, Definitions, Characteristics, Objectives, Importance, Functions and Process, Challenges, Recent Trends -Human Resources Manager – Duties and Responsibilities. The Components Of HR Systems: HR Philosophy; HR policies, practices and processes

UNIT – II

HUMAN RESOURCE SYSTEM DESIGN: HR Profession- Human Resource(HR) Professional Qualities and Skills ;HR Department-Meaning, Definitions, Characteristics, Objectives, Importance, Functions and Process of Human Resources Development-Differences between personnel Management and Human Resources Development; Line Management Responsibility in HRM; Performance Evaluation and Management: Selected Evaluation Techniques; Human Resource Accounting And Audit: Definition Of Human Resource Accounting (HRA), Need, Significance, Objectives For Hr, Measurements In HRA, Meaning of Human Resource Audit ,Need Of Human Resource Audit Conducting Human Resource Audit, Human Resource Audit Process; Information Management In HRA.

UNIT – III

Functional Areas of HRM: Recruitment and Staffing**:** Strategic recruitment decisions, Types of recruitment-Internal recruitment , External recruitment, Selection process, Staffing global assignments;
Compensation and Reward System: Compensation - Meaning, Definitions, Objectives and Importance-Wages and Salary Perquisites, Fringe Benefits, Bonus and Incentives – Meanings only, incentives in sun rise sector and sun set sector.
Employee Relations - Define employee relations, four methods for managing employee relations;
HR compliance: Meaning and Importance;
Human Resource Information Systems: Importance of HR Information Systems Features of HR Information Systems, Designing And Implementing an HRIS;
Payroll Management: What is Payroll Management , Importance of Payroll Management, Payroll Management Process, Payroll Processing Stages, Methods of Payroll Management.

UNIT – IV

Human Resource Planning: Strategic and Human Resource Planning, The HR Planning Process; Training And Development: Introduction: Training-Objectives, Training Process of training, Training needs assessment, Training evaluation, Development-Development process, Development needs analysis, Succession planning.

UNIT – V

Strategic Management of Human Resources: SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace.

Human Resource Management in Service Sector: Managing Human Element in Service Sector: Human Element in Service Sector – Introduction, Role and Significance; The Services Triangle ; Front Line Employees /Boundary Spanners – Meaning, Issues Faced by Front Line Employees: Person/Role Conflicts, Organization/Client Conflict, Inter client Conflict; Emotional Labour – Meaning, Strategies for Managing Emotional Labor**;** Flexible Working Practices – Implications for HR.

Text Books:

1. Prof. Gary Dessler , Human Resources Management, Pearson, 16th Edition, 2020.
2. Prof.JohnM.Ivancevich, "Human Resource Management", Tata McGraw Hill Publication, 12th Edition, 2003.
3. Prof.Aswathappa, "Human Resource Management and Personnel Management", 3 rd Edition, Tata McGraw Hill, 2002.

Reference Books:

1. Dr.C.B.Gupta, "Human Resource Management ", Sultan Chand & Sons, New Delhi, 1st Edition, 2018.
2. Prof.S.S.Khanka, "Human Resource Management", Chand & Company, New Delhi, 2019
3. Dr.S.Seetharaman et al., "Human Resource Management", SciTech Publications Pvt Ltd. Chennai,2012.

Question Paper Pattern:

Sessional Examination:

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

DESIGN PATTERNS (DP)

VII Semester: B. Tech						Scheme: 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 422	Open Elective - IV	3	0	0	3	40	60	100
Sessional Exam Duration: 1½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the usage of design patterns for solving object-oriented design problems

CO2: Describe the creational patterns abstract factory, factory method, builder, prototype, and singleton.

CO3: Understand structural patterns: adapter, bridge, composite, decorator, facade, fly weight, proxy.

CO4: Explain behavioral patterns chain of responsibility, command, interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor.

CO5: Explain the patterns used in solving design problems of Lexi Document Editor

UNIT – I

Design Pattern Introduction: What Is a Design Pattern, Describing Design Patterns, the Catalog of Design Patterns, Organizing the Catalog, How to Select a Design Pattern, How to Use a Design Pattern, How Design Patterns Solve Design Problems?

UNIT – II

Creational Patterns: Abstract Factory Pattern, Builder Pattern, Factory Method Pattern, Prototype Pattern, Singleton Pattern.

UNIT – III

Structural Patterns: Adapter Pattern, Bridge Pattern, Composite Pattern, Decorator Pattern, Facade Pattern, Flyweight Pattern, Proxy Pattern.

UNIT – IV

Behavioral patterns: Chain of responsibility Pattern, Command Pattern, Interpreter Pattern, Iterator Pattern, Mediator Pattern, Memento Pattern, Observer Pattern, State Pattern, Strategy Pattern, Template method Pattern, Visitor Pattern.

UNIT – V

A Case Study: Designing a Document Editor, Design Problems, and Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

Text Books:

1. Erich Gamma [2008], Design Patterns elements of reusable object oriented software, Pearson Education.

2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal, PatternOriented Software Architecture: A System of Pattern, John Wiley & Sons; 1996.

Reference Books:

1. Mark Grand, Pattern's in JAVA Vol-I, Wiley DreamTech

2. Mark Grand, Pattern's in JAVA Vol-II, Wiley DreamTech

3. Mark Grand [2006], JAVA Enterprise Design Patterns Vol-III, Wiley DreamTech

4. Eric Freeman-Oreilly-spd, Head First Design Patterns.

5. Alan Shalloway,Design Patterns Explained, Pearson Education.

Web References:

1. https://sourcemaking.com/design_patterns

2. https://www.oodesign.com/

Question Paper Pattern:

Sessional Examination:
The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination:
The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub question and the student should answer any one question from each unit. Each Question carries 12 marks.

PRESTRESSING SYSTEMS (PS)

VII Semester :B. Tech						Scheme : 2020		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OEC 423	Open Elective - IV	3	-	-	3	40	60	100
Sessional Exam Duration: 1½ Hrs						End Exam Duration: 3 Hrs		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the principles and systems of pre-stressing.

CO2: Understand the various methods of pretensioning

CO3: Understand the various methods of post tensioning

CO4: Determine the losses in pre-tensioned and post-tensioned members.

CO5: Analyse the prestressed members with straight, concentric and eccentric tendons.

UNIT – I

Introduction: Historical development – General principles of prestressing – Pretensioning and post tensioning – Advantages and limitations of prestressing – Need for high strength steel and high grade concrete for prestressed elements – Prestressing types.

UNIT - II

Methods and Systems of Pretensioning: Pre tensioning methods – Tensioning devices -Long line system (Hoyer system) -Individual Mould System - Strut system (ShorerChalos System) – Comparison of the various systems - Precast elements – Poles, Masts, Pylons and railway sleepers their advantages and disadvantages, applications and manufacturing techniques

UNIT – III

Methods and Systems of Posttensioning: Tensioning device for post tensioning –Methods of post tensioning - MagnelBlatonsystem, Freyssinet system, Gifford Udall system, Lee McCall System, Prescon System, Baur – Leonhardt System – Comparison of Pretensioning and Posttensioning systems

UNIT – IV

Losses of Prestress: Losses of prestress in pre tensioned and post tensioned members due to instantaneous losses – elastic deformation, friction and anchorage slip; time-dependent losses – shrinkage, creep and relaxation of stress.

UNIT - V

Analysis of Sections for Flexure: Elastic analysis of concrete beams prestressed with straight,concentric, eccentric, bent and parabolic tendons – Kern lines – Cable profile.

Text Books:

1. N. Krishna Raju, Prestressed Concrete, Sixth Edition, Tata McGraw–Hill publishing Company Limited.
2. Praveen Nagarajan, Prestressed Concrete, Pearson Education Inc., New Delhi.
3. G.S. Pandit, S.P. Gupta, Prestressed Concrete, CBS Publishers and Distributors Pvt. Ltd., Vijayawada.

Reference Books:

1. E. G. Nawy, Prestressed Concrete: A fundamental approach, Prentice Hall.

Reference Codes:

1. IS 1343-2012, Code of Practice for Prestressed Concrete, BIS, New Delhi.
2. IS 456-2000, Code of Practice for plain and reinforced concrete, BIS, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.

ADDITIVE MANUFACTURING TECHNOLOGY (ADMT)

VII Semester: B. Tech — **Scheme : 2020**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
OEC 424	OEC – IV	3	-	-	3	40	60	100

Sessional Exam Duration : 1 ½ Hrs — **End Exam Duration : 3 Hrs**

Course Outcomes : At the end of the course the student will be able to

CO1: Understand prototyping, and the phases of Rapid prototyping.

CO2: Understand the rapid prototyping process chain.

CO3: Understand the functioning of Liquid based rapid prototyping systems.

CO4: Understand the functioning of Powder based rapid prototyping systems.

CO5: Understand the Direct methods of Tooling and Indirect methods of Tooling.

UNIT – I

Introduction: Historical Development, Definition of prototype, types of prototypes, Role of prototypes, Three phases of development leading to Rapid prototyping, Fundamentals of rapid prototyping, Applications and advantages of rapid prototyping.

UNIT – II

Rapid prototyping process chain: 3D modelling, data conversion and transmission, checking and preparing, Building and post processing. Liquid based rapid prototyping systems- Stereo Lithography Apparatus (SLA), applications, advantages and disadvantages of Stereo lithography. STL file format, Types of Errors.

Fusion Deposition Modelling: Principle, process, applications, advantages and disadvantages of FDM, Multi Jet Modelling Systems.

UNIT – III

Solid based rapid prototyping systems: Laminated Object Manufacturing (LOM), three phases of LOM Applications of LOM, advantages and disadvantages of LOM.

Solid Ground Curing(SGC): Steps in solid ground curing, Applications of solid ground curing, advantages and disadvantages of Solid ground curing, build time calculation.

UNIT – IV

Powder-based Rapid prototyping systems: Selective Laser Sintering (SLS), Materials for SLS, Principle, Process, Applications, advantages and disadvantages of SLS.

Three Dimensional Printing (3DP): Principle, Process, Applications, advantages and disadvantages of 3DP

Laser Engineered Net Shaping (LENS) : Principle, Process steps, Applications, Advantages and disadvantages of LENS

UNIT – V

Direct methods of rapid tooling : AIM tooling, SLS rapid steel, Direct Laser Metal Sintering (DMLS), Laminate tooling

Indirect methods of rapid Tooling: RTV silicon rubber moulds, Vacuum casting, Reaction injection Moulding(RIM),Wax Injection moulding, Spray metal tooling, 3D kelt tool

Text Books

1. Chua C.K., Leong.K.F, and Lim C, C.S., Rapid Prototyping Principles and Applications, World Scientific Publishing Co. Pte. Ltd
2. D.T.Pham and S.S.Dimov, Rapid manufacturing The technologies and applications of rapid Prototyping and rapid tooling. Springer Publications

Reference Books

1. Terry Wholers, Wholers report, Wholers Associates
2. I. Gibson D. W. Rosen and B. Stucker., Additive manufacturing technologies, Springer Publication

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

DRONE TECHNOLOGY (DT)

VII Semester: B. Tech						Scheme: 2020		
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
OEC 425	**Open Elective - IV**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration: 1½ Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes: At the end of the course students will be able to

CO1:	Understand the historical development of unmanned aerial vehicles
CO2:	Understand different drone parts and their contribution for successful flight operation
CO3:	Identify the battery to be used for UAV application.
CO4:	Understand working of motor that can be used in UAV.
CO5:	Classify different microcontrollers and flight controllers

UNIT – I

Introduction to drones and their applications: - Definition of drones, history of drones, Structural classification of drones: - fixed wing structure, lighter than air systems, rotary wings aircraft and applications of drones.

UNIT – II

Components of drones:-classifications of drone structures and their suitability, applications and uses of drone frame materials, classifications and applicability of propeller motors, drone materials, design parameters for propellers, composition and structuring of Electronic speed controller, flight control board, characteristics of FCB and their structure.

UNIT – III

Battery and its management: Introduction of Battery, Description of Li-Po Battery, Charging / Discharging of Battery. Back up, Ratings, Shelf Life, Maintenance and safety of Battery. Selection criteria of Battery for Drone application.

UNIT – IV

Sensors : Wi fi devices, RADAR and range finder, GPS receiver, Gyro sensor, Speed and Distance sensor, Image sensor, TOF sensor, Chemical sensor. Cameras in drones and selection criteria of camera for different range. Barometers, Accelerometer, Magnetometer, remote control for drone.

Motors : Difference between AC and DC motors and stepper motor, Brushed and Brushless motors, brief idea of motor capabilities for a drone build. Selection criterion of motor for drone application. Working and application of BLDC motor.

UNIT – V

Connections and Interfaces of Devices in Drone:Brief introduction of RS232, RS422, RS485, UART ports. Different types of connectors and their specifications. Microcontroller interfacing techniques.

Introduction to Drone Programming Introduction to programming language used in drone: C and Python. Installation of cards.Auto Pilot software i.e. Ardupilot, Openpilot

Text Books:

1. Terry Kilby and Belinda Kilby, "Make:Getting Started with Drones ",Maker Media, Inc, 2016

2. VasilisTzivaras, "Building a Quadcopter with Arduino", Packt Publishing, 2016

3. Donald Norris, "Build Your Own Quadcopter -Power Up Your Designs with the Parallax Elev-8" , McGraw-Hill Education, 2014

Reference Books:

1. Baichtal, "Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs", Que

Publishing,2016.
2. Austin, Unmanned Aircraft Systems: UAVS Design, Development and Deployment. Wiley, 2010.
3. Sebbane, Smart Autonomous Aircraft: Flight Control and Planning for UAV. CRC Press, 2015
4. Zavrsnik, Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance. Springer, 2015.

Web References :

1. https://www.dronezon.com/learn-about-drones-quadcopters/
2.http://ardupilot.org/copter/docs/advanced-multicopter-design.html

Question Paper Pattern:

Sessional Exam :

The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (Either or Type) in each section. The student shall answer one question from each section.

End Exam:

The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub-questions. And the student should answer any one question from each unit. Each Question carries 12 marks.

INFRASTRUCTURE FOR SMART CITY DEVELOPMENT (ISCD)								
VII Semester :B. Tech						**Scheme : 2020**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OEC 426	**Open Elective - IV**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Sessional Exam Duration:1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1: Understand the fundamental concepts of smart and sustainable cities.

CO2: Understand the GIS applications in Smart City Planning.

CO3: Understand the component of smart cities and dwell into their technological advancement.

CO4: Understand the involvement of stake holders in the design and implementation of responsive smart cities.

CO5: Explain the importance of different linkages and their defined roles including government, urban planners, universities, city developers and communities.

UNIT – I

Smart City Planning – An Overview: Understanding – Dimensions – Global experience, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

UNIT - II

Green Building Concepts & Sustainable Development: Green projects in smart cities, sustainability – Green building – Rating system – Energy efficient building – Energy saving systems.

GIS Applications in Smart City Planning: Coordinate system and geo-coding, vector data structure and algorithms, raster data structure and algorithms, data bases for GIS – Concepts, error modeling and data uncertainty, decision making through GIS, constructing spatial data infrastructure and spatial information system. National Urban Information system. Why remote sensing, aerial & satellite remote sensing – Principles of aerial remote sensing – Aerial photo-interpretation – Photogrammetry – Stereovision – Measurement of heights/depths by relief displacement and parallax displacement. Principles of satellite remote sensing, spatial, spectral and temporal resolutions.

UNIT – III

Smart Urban Transportation Systems: Elements of Infrastructure (Physical, Social, Utilities and services) - Basic definitions – Concepts - Significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, Provision of infrastructure; Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues; Urban form and Transport patterns, land use – Transport cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT – IV

Water Supply and Drainage: Water – sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues. Sanitation – points of generation, collection, treatment, disposal, norms and standards, grey water disposal, DEWATS, institutional arrangements, planning provisions and management issues. Municipal and other wastes – generation, typology, quantity, collection, storage, transportation, treatment, disposal, recycling and reuse, wealth from waste, norms and standards, institutional arrangements, planning provisions and management issues. Power – Sources of power procurement, distribution networks, demand assessment, norms and

standards, planning provisions and management issues.

UNIT - V

Project Management for Smart Cities: Philosophy and concepts of Project management phases – Stages of project & their approval status – Planning – Scheduling – PERT model - Project cost analysis – Resource allocation & Levelling – Project monitoring and control – Risk management – Case studies.

E–Governance and IOT: The concept of management – Concept of e-management &e-business - e-Government Principles – Form e-Government to e-governance - e-governance and developing countries – Designing and Implementing e-Government Strategy; E-governance: Issues in implementation. IOT-fundamentals, protocols, design and development, data analytics and supporting services, case studies.

Text Books:

1. Gupta Tripati, Smart cities transforming India, Pentagon Press.
2. Marta Peris-Ortize, Dag r Bennett, Diana Perez, Bustamante Yabav, Sustainable Smart Cities, Springer
3. Mani. N, Smart Cities and Urban Development in India, New Century Publications.

Web References:

1. https://smartnet.niua.org
2. https://smartcitiescouncil.com
3. https:// mygov.in/group/smart- cities.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination is for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of Three Sections with Two Questions (EITHER / OR type) in each section. The student shall answer one question from each section.

End Exam: The question paper for end examination is for 60 marks. It shall consist of Five Units, each containing Two Questions (EITHER / OR type) from each unit of the syllabus, with a weightage of 12 marks. Each of these questions may contain sub-questions. The student shall answer one question from each unit.