B.Tech

ELECTRICAL AND ELECTRONICS ENGINEERING (Second Year Scheme of Instruction & Detailed Syllabus)



Department of Electricaland Electronics Engineering Velagapudi Ramakrishna

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V.R.SIDDHARTHA ENGINEERING COLLEGE: VIJAYAWADA DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- **PEO1:** Excel in chosen career and/or higher education.
- **PEO2:** Exhibit professionalism, ethical, attitude, communication skills, teamwork and adapt to current trends by engaging in lifelong learning.
- **PEO3:** Demonstrate technical competence in solving engineering problems that are economically feasible and socially acceptable.

PROGRAMME OUTCOMES

- **PO1:Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- **PO3: Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5:** Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
- **PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9:** Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11: Project Management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12. Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAMMESPECIFICOUTCOMES

- **PSO1: Understand, analyze** and design systems that efficiently generate, transmit, distribute and utilize electric power.
- **PSO2:**To expertise in the technology associated with efficient conversion and control of electrical power to the required form.

SEMESTER-III

S.No	Course Code	Course Category	Course	L	Т	Р	Credits
1.	23BS3101D	BS&H	Transformation and Numerical Methods	3	0	0	3
2.	23HS3102	Humanities & Science	Universal Human Values – Understanding Harmony	2	1	0	3
3.	23EE3103F	Engineering Science	Electronic Circuits	3	0	0	3
4.	23EE3304	Professional Core	Electrical Circuit Analysis-II	3	0	0	3
5.	23EE3305	Professional Core	Electrical Machines-I	3	0	0	3
6.	23TP3106	Soft Skill-1	Logic and Reasoning	0	0	2	1
7.	23MC3107	Audit Course	Environmental Science	2	0	0	-
8.	23EE3651	Skill Enhancement Course	Python Programming lab	0	0	2	1
9.	23EE3352	Professional Core	Electrical Machines-I lab	0	0	3	1.5
10	23EE3353	Professional Core	Electronics lab	0	0	3	1.5
			TOTAL	17	0	10	20

Category	Credits
Basic Science Courses	3+3=6
Professional core Courses	3+3+3+1.5+1.5 = 12
Soft skill	1
Skill enhancement course	1
Audit/Mandatory Courses	0
TOTAL CREDITS	20

SECOND YEAR DETAILED SYLLABUS

SEMESTER-III

23BS3101D-TRANSFORMATIONS & NUMERICAL METHODS

Course Category:	Basic Science Course	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Basic concepts of Trigonometry, calculus and theory of equations, Differential equations and vector calculus (23BS2101)	Continuous Evaluation: Semester End Evaluation: Total Marks:	30M 70M 100M

Cou	rse ou	tcome	S											
	Upon successful completion of the course, the student will be able to:													
CO1	Apply Laplace Transforms to evaluate indefinite integrals and solutions of differential equations													
CO2	Analyze general periodic functions in the form of an infinite convergence series of sines and cosines.													
CO3	Find solutions for algebraic, transcendental, system of equations and estimate functions using polynomial interpolation.													
CO4	04 Solve initial value problems and evaluate derivatives and integrals numerically.													
Cont (1 - 1	ributi Low, 1	on of 2 - Me	Cours edium	e Out , H - H	comes Iigh)	s towa	rds ac	hieve	ment	of Pro	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			1								1	1
CO2	3	2			1								1	1
CO3	3	2			1								1	1
CO4	3	2			1								1	1
Cou	rse C	onten	t											

UNIT-I

[Text Book-1]

Laplace transforms: Introduction, definition, transforms of elementary functions, properties of Laplace transforms, transforms of periodic functions, transforms of derivatives and integrals, multiplication by t^n , division by t, evaluation of integrals by Laplace transforms, inverse transforms-method of partial fractions, other methods of finding inverse transform, convolution theorem, application of differential equations.

UNIT-II

[Text Book-1]

Fourier Series: Introduction, Euler's formulae, conditions for a Fourier expansion, functions having points of discontinuity, change of interval, odd and even functions, half-range series, parseval's formula, complex form of Fourier series.

UNIT-III

[Text Book-1]

Numerical Solutions of Equations: Introduction, Solution of algebraic and transcendental equations-introduction, Newton-Raphson method, Useful deductions from Newton-Raphson formula, solution of simultaneous linear equations-Gauss-Seidel iterative method.

Finite differences and Interpolation: Finite differences, differences of a polynomial, other difference operators, relations between the operators, to find one or more missing terms, Newton's interpolation formulae, Interpolation with unequal intervals,-Lagrange's interpolation formulae, divided differences and Newton's divided difference formulae.

UNIT-IV

[Text Book-1]

Numerical Differentiation and Integration: Numerical differentiation, Formulae for first and second order derivatives using Newton's formulae, Numerical Integration, Trapezoidal rule, Simpsons 1/3 and 3/8th rule.

Numerical Solutions of Differential Equations: Taylor's series method, Euler's method, Euler's modified, Modified Euler's method, Runge-Kutta method of 4th order.

Text Book:

[1] B.S.Grewal, "*Higher Engineering Mathematics*", Khanna Publishers, 44th edition, 2017.

Reference Books:

- [1] Krezig, "Advanced Engineering Mathematics", JohnWiley & sons, 8th edition, 2007.
- [2] N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications (P) Limited, 1stedition, 2011.
- [3] S.S.Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 2005.

E-resources and other digital material

- [1] Prof. Ameeya Kumar Nayak, Sanjeev Kumar, IIT Roorkee, Numerical methods, Available: https://onlinecourses.nptel.ac.in/noc21_ma45/preview
- [2] Henrik Schmidt, Massachusetts Institute of Technology: MIT Open Courseware, Introduction to Numerical Analysis for Engineering. Available: https://ocw.mit.edu
- [3] Prof. Adrijit Goswami, IIT Kharagpur, Transform Calculus and its applications in Differential Equations.

Available: https://nptel.ac.in/courses/111/105/111105123/

23HS3102–Universal Human Values II–Understanding Harmony

			,
Course Category:	Basic Science	Credits:	3
Course Type:	Mandatory course	Lactura Tutorial Practica	2-1-0
	(suggested by AICTE)	Lecture-Tutomai-Tractice.	
Prerequisites:	Universal Human Values 1	Continuous Evaluation:	30M
	desirable	Semester End Evaluation:	70M
		Total Marks:	100M

Cou	rse ou	tcome	S											
	Upon successful completion of the course, the student will be able to:													
CO1	Understand and aware of themselves and their surroundings (family, society and nature).													
CO2	Handle problems with sustainable solutions, while keeping human relationships and human nature in mind.													
CO3	Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.													
CO4	4 Apply what they have learnt to their own self in different day-to-day settings in real life.													
Cont (1 -]	tributi Low, 1	on of 2 - Me	Cours edium	e Outo , 3 - H	comes ligh)	s towa	rds ac	hiever	ment	of Prog	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1			2					
CO2			3											
CO3						2								
CO4	04 3 2													
Cou	Course Content													

UNIT-I

[Text Book-1]

Course Introduction, Need, Basic Guidelines, Content and Process for Value Education:

Part-1: Purpose and motivation for the course, recapitulation from UHV-I, 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.

Part-2: Right understanding, relationship and physical facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority, understanding happiness and prosperity correctly – a critical appraisal of the current scenario, method to fulfill the above human aspirations- understanding and living in harmony at various levels.

(Practice sessions are to be included 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).

UNIT-II

[Text Book-1]

Understanding Harmony in the Human Being – Harmony in Myself: Part-1: 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).

Part-2: 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. (Practice sessions are to be included 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).

UNIT-III

[Text Book-1]

Understanding Harmony in the Family and Society–Harmony in Human-Human Relationship:

Part-1: Understanding values in human-human relationship, meaning of justice (nine universal values in relationships) and program for its fulfillment 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.

Part-2: 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.

(Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life 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

[Text Book-1]

Part-1:Understanding Harmony in Nature & Existence–whole existence as coexistence: Understanding the harmony in the nature, interconnectedness and mutual fulfillment 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.

Part-2: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, sefinitiveness 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.

(Part-1: Practice sessions are to be included to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc.)

(Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions e.g. to discuss the conduct as an engineer or scientist, etc.).

Text books:

[1] R. R. Gaur, R. Sangal and G. P. Bagaria, "Human values and professional ethics", Excel Books Private Limited, New Delhi, 2010

Reference Books:

- [1] A. Nagaraj, "JeevanVidya: EkParichaya", JeevanVidya Prakashan, Amarkantak, 1999
- [2] A. N. Tripathi, "Human Values", New Age International Publishers, New Delhi, 2010.
- [3] Annie Leonard, "The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better", Free Press, New York 2010.
- [4] Mohandas Karamchand Gandhi, "*The story of my experiments with truth: Mahatma Gandhi Autobiography*", B. N. Publishing, 2008.
- [5] E. F. Schumacher, "Small is beautiful: A study of economics as if people mattered", Vintage Books, London, 1993.
- [6] Cecile Andrews, "Slow is beautiful: New Visions of Community", New Society Publishers, Canada 2006.
- [7] J. C. Kumarappa, "Economy of Permanence", Sarva-Seva-SanghPrakashan, Varanasi, 2017.
- [8] 2. K. Gandhi, "*Hind Swaraj or Indian Home Rule*", Navajivan Publishing House, Ahmedabad 1909.
- [9] MaulanaAbulKalam Azad, "India Wins Freedom: The Complete Version", Orient Black swan, 1988.
- [10] Romain Rolland, "Mahatma Gandhi: The Man who become one with the Universal Being", Srishti Publishers & Distributors, New Delhi, 2002.

E-resources and other digital material:

[1] AICTE – SIP

[2] Youtube channel:https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ.

[3] AICTE – UHV Teaching Learning Material:

https://fdp-si.aicte-india.org/download.php#1

23ES3103E- ELECTRONIC CIRCUITS

Course Category:	Engineering Science Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Engineering	Continuous Evaluation:	30M
	Physics(23BS2102A)	Semester End Evaluation:	70M
	BEE-23ES1103B	Total Marks:	100M

Course outcomes														
	Upon successful completion of the course, the student will be able to:													
CO1	Design and Implement combinational logic circuits.													
CO2	Elucidate flip-flops, registers, counters and Design sequential logic circuits													
CO3	Understand the operation and design of BJT and FET amplifier circuits for a given specification													
CO4	Analyze various stability biasing techniques in BJT and FET													
Cont (1 - 1	ributi Low, 2	on of 2 - Me	Cours edium	e Outo , 3 - H	comes ligh)	s towa	rds ac	hieve	ment	of Prog	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		3										2
CO2	2	3	3	3										2
CO3	2	3	3	3		1								2
CO4	2	2	3	3		3								2
0														

Course Content

UNIT-I

[Text Book-1 & 2]

BJT Amplifiers: Introduction, Overview of BJT, Overview of Input-output characteristics of CB, CE, and CC configurations, Load line analysis, Operating point.

FET Amplifiers: Classification, JFET construction, operation, I-V characteristics- common source, common drain, and common gate configurations, MOSFET- Depletion - type MOSFET and Enhancement - type MOSFET construction and operation, I-V characteristics.

UNIT-II

[Text Book-1 & 2]

BJT Biasing Circuits: Significance of biasing, biasing circuits- fixed bias, collector to base bias, self-bias, stability factors, bias compensation circuits, diode compensation for V_{BE} and I_{CO} , thermistor and sensitor compensation, thermal runaway, and thermal stability.

FET Biasing Circuits: Introduction, Fixed bias configuration, Self-bias configuration, Voltage divider bias configuration.

UNIT-III [Text Book-3&4] Minimization of Switching Functions: SOP and POS forms, K-map representations,

minimization using K-maps, simplification, don't care conditions, Quine-Mccluskey method. **Combinational Logic Design:** Adders, subtractors, multiplexers and de-multiplexers, decoders and encoders, code converters.

UNIT-IV

[Text Book-3 &4]

Sequential Logic Circuits: SR, JK, D and T flip-flops, level triggering and edge triggering, conversion of flip-flops, Shift registers,

Design of Counters: Design of asynchronous and synchronous counters, modulus and ring counters.

Text Books:

- [1] Robert L Boylested and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI, 8thedition, 2003
- [2] S Salivahana "Electronic Devices and Circuits" Tata McGraw Hill Ltd, 2nd edition, 2011.
- [3] R P Jain, "Modern Digital Electronics", Tata Mc. Graw Hill Publication, New Delhi, 4th edition, 2010
- [4] M. Morris Mano, "Digital Logic and ComputerDesign", Pearson India Education Services Ltd., 2016.

Reference Books:

- [1] Taub& Schilling, "Digital integrated Electronics", Mc Graw-Hill, Delhi, 1986.
- [2] AnandKumar, "Fundamentals of Digital Circuits" Prentice Hall of India, 2nd edition, 2009.
- [3] Gordon J Deboo& Clifford N. Burrous, "Integrated Circuits and Semiconductor Devices", International StudentEdition, Tata McGraw-Hill, 2nd edition.
- [4] David A Bell., "Electronic Devices and Circuits", 5th Edition, (2008), Oxford University Press.
- [5] Jacob Millman and Christos C Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw Hill Ltd, 2003.
 - G.K. Mithal "Electronic Devices and Circuits" Khanna Publishers, 1997.

E-resources and other digital material

- [1] http://www.nptel.ac.in/courses/117106086/
- [2] http://www.docstoc.com/docs/14901337/Fundamentals-of-Digital-Electronics
- [3] <u>http://www.ebookee.com/Fundamentals-of-Digital-Electronics_313329</u>.
- [4] Tony R. Kuphaldt, "*Electric Circuits, Volume III-Semiconductors*", 5th edition, 2009 (e-book).
- [5] <u>http://nptel.iitm.ac.in/courses.php?branch=Ece</u>
- [6] <u>www.ibiblio.org/obp/electricCircuits</u>

23EE3304-ELECTRICAL CIRCUIT ANALYSIS-II

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Electrical Circuit Analysis-I	Continuous Evaluation:	30M
	(20PC2104D)	Semester End Evaluation:	70M
		Total Marks::	100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1 Analyze transient response of electric circuits.

CO2 **Determine** network functions and two-port parameters.

CO3 Apply poly-phase circuits and apply different power measurement techniques.

CO4 Synthesize single port networks.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2	2						3		3	
CO2	3	3	1	2							3		2	
CO3	3	3			1						3		2	
CO4	3	3	3								3		1	

Course Content

UNIT-I

[Text Book-1&2] Transients: Introduction-initial conditions, direct current transients- RL, RC, RLC circuits, two mesh transients. Alternating current transients - RL, RC, and RLC circuits, two mesh transients (Both differential equation and Laplace transform approaches).

UNIT-II

[Text Book-1]

Network Function: Introduction, driving point functions, transfer functions, Poles and Zeros of network functions, restrictions on poles and zeros for driving- point and transfer functions.

Two Port Networks: Introduction, open circuit impedance parameters, short circuit admittance parameters, transmission (ABCD) parameters, hybrid parameters, interconnections- cascading, series, parallel.

UNIT-III

Poly-phase Circuits: Poly-phase system, advantages of three-phase system, generation of three-phase voltages, phase sequence, inter connection of three-phase sources and loads, voltage, current and power in a star connected system, voltage, current and power in a delta connected system, three-phase balanced circuits.

Power Measurement in Three-Phase Circuits: Power in three phase circuits-two wattmeter and three watt meter methods, power factor of balanced circuits by two watt

[Text Book-1]

meter method, variation in watt meter readings with load power factor (lag and lead p.f. loads), measurement of reactive power with two watt meter.

UNIT-IV

[Text Book-1]

Network Synthesis:Introduction, Hurwitz polynomials and properties, positive real functions and its properties, elementary synthesis concepts, realization of LC, RC and RL functions of single port networks using Foster form and Cauer form.

Text Books:

- [1] Ravish R Singh, "*Network Analysis and Synthesis*", McGraw-Hill Education (India) Pvt.Ltd., Chennai, 1stedition, 2018.
- [2] A. Chakrabarthi, "Circuit Theory (Analysis and Synthesis)", Dhanpat Rai & Co. Pvt.Ltd., 6th edition, 2013.

Reference books:

- [1] M.E.VanValkenburg, "*Network Analysis*", Prentice Hall of India Pvt. Ltd, New Delhi, 3rdedition, 2006.
- [2] William H.Hayt, Jack.E.Kemmerly&Steven.M Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill, New Delhi, 8thedition, 2012.
- [3] Charles K.Alexander& Matthew N. O. Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, 5thedition, 2012.
- [4] A.Sudhakar&P.Shyam Mohan, "Circuits and Networks Analysis and Synthesis", Tata McGraw-Hill, New Delhi, 3rdedition, 2007

E-resources and other digital material

[1] http://nptel.ac.in/courses/108102042/

23EE3305-ELECTRICAL MACHINES-I

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Basic Electrical & Electronics Engg. (20ES2103B)	Continuous Evaluation: Semester End Evaluation: Total Marks:	30M 70M 100M

Cou	ise ou	tcome	\$											
	Upor	Upon successful completion of the course, the student will be able to:												
CO1	Analyze the construction, operation and performance of DC generators.													
CO2	Analyze the operation and performance of DC motors.													
CO3	Analyze and Evaluate the performance of single phase transformers.													
CO4	Ana	lyze a	nd Ev	aluat	e the p	perform	mance	of th	ree ph	ase tra	nsforr	ners		
Cont (1 -]	Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
001	•	•	•	•			•						•	•

COI	3	3	2	3					3	3
CO2	3	3	2	3	3				1	2
CO3	2	3	2	3	2				2	2
CO4	3	1	2	3	3				2	3
0	0		,				,	,		

Course Content

Course outcomes

UNIT- I

[Text Book-1& 2]

DC Generators: Principle of Electromechanical Energy Conversion, Construction and principle of operation of DC generator, EMF equation, armature reaction, types of DC Generators, operating characteristics of DC generators, applications of DC generator.

UNIT-II

[Text Book-1 & 2]

DC Motors: Principle of operation, significance of back EMF, torque equation, characteristics of DC motors, starting methods, speed control methods, losses and efficiency. Testing of DC machines-Brake test on dc shunt motor, Swinburne's test, applications of DC motors.

UNIT-III

Single Phase Transformer: Transformer construction, principle of operation, EMF equation, ideal transformer, practical transformer, phasor diagram, equivalent circuit, transformer losses, regulation and efficiency, all day efficiency, auto transformer, Transformer testing- open circuit and short circuit tests, parallel operation of single phase transformer, applications of transformers.

UNIT-IV

Three-Phase Transformer: Three phase transformer construction, three phase transformer

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[Text Book-1]

[Text Book-1]

connections, phase groups, parallel operation of three phase transformers, three winding transformers (Tertiary winding), open delta connection, tap changing of transformers.

Text Books:

- [1] I.J.Nagrath and D.P. Kothari, "*Electric Machines*", Tata McGraw-Hill Education Private Limited Publishing Company Ltd, New Delhi, 4thedition, 2010.
- [2] Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Co. (Pvt) Ltd, 2nd edition, 2009.

Reference Books:

- [1] P. S. Bhimbra, "Electrical Machinery", Khanna Publications, 7thedition, 2007.
- [2] A.E.Clayton, "*The Performance & design of DCMachines*", CBS publisher& distributors, Delhi, 1stedition, 2003.
- [3] A.E Fitzgerald and Charles Kinsley, "*Electric Machinery*", Tata McGraw-Hill Education Private Ltd, New Delhi, 6thedition, 2002.
- [4] J.B. Gupta, "Theory & Performance of Electrical Machines", S.K.Kataria& Sons, New Delhi, 15th edition, 2015
- [5] B.L.Theraja and A.K.Theraja, "*Electric Technology*", S Chand & Co.(Pvt.) Ltd, New Delhi, Volume-II, 2012.

E-resources and other digital material

[1] <u>http://nptel.ac.in/courses/108105017/</u>

23TP3106 - LOGIC AND REASONING

Course Category:	Institutional Core Soft skill-1	Credits:	1
Course Type:	Learning by doing	Lecture-Tutorial-Practice:	0-0-2
Prerequisites:		Continuous Evaluation:	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes														
	Upor	n succ	essfu	l com	pletio	n of tl	ne cou	rse, tl	he stu	dent w	ill be a	able to:		
CO1	Thin	k reaso	on logi	ically i	in any	critica	l situat	ion						
CO2	Anal	yze giv	ven inf	ormati	ion to t	find co	orrect s	olutio	n					
CO3	To reduce the mistakes in day to day activities in practical life													
CO4	Develop time management skills by approaching different shortcut methods													
CO5	Use mathematical based reasoning to make decisions													
CO6	Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams													
Cont (1 - I	Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2								
CO2		2												
CO3								2						
CO4									2					
CO5														
CO6	1													

Course Content

UNIT-I

- Series Completion,
 Coding-Decoding,
 Blood Relation,

- 4. Puzzles test

UNIT-II

- 1. Direction Sense Test
- 2. Logical Venn diagrams,
- 3. Number test, ranking test,
- 4. Mathematical operations

5. UNIT-III

- 1. Arithmetical Reasoning,
- 2. Inserting missing character,
- 3. Syllogism.
- 4. Binary logic.
- 5. Data sufficiency

UNIT-IV

Non-Verbal

- 1. Water images,
- 2. Mirror images,
- 3. Paper folding,
- 4. Paper cutting,
- 5. Embedded Figures,
- 6. Dot situation,
- 7. Cubes & Dice

Text Books:

- [1] R. S. Aggarwal, "*Verbal and non-verbal reasoning*", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6.
- [2] by Vikramjeeth ,"Reasoning Guru Verbal & Non-Verbal Reasoning" ISBN :978-9358706000, Multilingual Edition, -2023.

23MC3107 - ENVIRONMENTAL SCIENCE

CourseCategory:	Audit	Credits:	-
Course Type:	Theory Mandatory course	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:	Consciousness of	Continuous Evaluation:	100M
	Environment	Semester End Evaluation:	-
		Total Marks:	100M

Cou	rse ou	tcome	S											
	Upor	n succ	essful	comp	letion	of the	e cour	se, the	e stud	ent wil	ll be al	ble to:		
CO1	Ident	ify var	ious fa	ctors c	ausing	, degra	dation	of nati	ural res	source	and cor	ntrol me	easures	•
CO2	Identify various ecosystem and need for biodiversity.													
CO3	Realize and explore the problems related to environmental pollution and its management.													
CO4	Apply the information and technology to analyze social issues, use acts associated with environment.													
Cont (1 -]	tributi Low, 2	on of 2 - Me	Cours edium	e Outo , 3 - H	comes ligh)	s towa	rds ac	hieve	ment	of Prog	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1							1						
CO2	02 1 1 1 1 1													
CO3				1	1							1		
CO4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													

Course Content

UNIT-I

[Text Book-1]

The Multidisciplinary Nature of Environmental Studies -Definition, scope and importance Need for public awareness.

Natural Resources :

Renewable and Non-Renewable Resources: Natural resources and associated problems.

(a)Forest Resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.

(b)Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c)Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.

(d)Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

(e)Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

(f)Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion

UNIT-II

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT-III

[Text Book-1]

[Text Book-1]

Environmental Pollution: Definition, causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Disaster Management: Floods, earthquake, cyclone and landslides.

UNIT-IV

[Text Book-1]

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns.

Environmental Ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, wasteland reclamation, Consumerism and waste products.

Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation.

Public Awareness: Human population and the environment, population growth, variation among nations, population explosion—family welfare program me.

Environment and Human Health: Human rights, Value education, HIV/AIDS, women and child welfare, role of information technology in environment and human health.

Field Work/ Case Studies: Visit to a local area to document environmental assetsriver/forest/grassland/hill/mountain, visit to a local polluted site-Urban/Rural/Industrial /Agricultural, study of common plants, insects, birds, study of simple ecosystems-pond, river, hill slopes, etc.

Self-Study: Water resources, Threats to biodiversity, Solid waste management, Role of Information Technology in environment and human health.

Text books:

[1].Erach Bharucha, "Environmental Studies for undergraduate courses", University Grants Commission, New Delhi, BharatiVidyapeeth Institute of Environment Education and Research, 2004.

Reference Books:

[1]	AnjaneyuluY,	"Introduction	to	Envire	onm	iental	sciences'	', BS	5 Publications	s private	Ltd,
	Hyderabad.										
[2]	Aniiraddy "	Environmental	60	ionco	S.	Tech	nology"	PC	Dublications	nrivoto	Itd

- [2] Anjireddy," *Environmental science & Technology*", BS Publications private Ltd, Hyderabad.
- [3] Benny Joseph, "Environmental Studies", The Tata McGraw- Hill publishing companyLtd, New Delhi, 2005.
- [4] P.VenuGopalaRao, "Principles of Environmental Science. & Engg.", Prentice-Hall of India Pvt. Ltd., New Delhi, 2006.
- [5] Santosh Kumar Garg, Rajeswari Garg, RajaniGarg, "Ecological and Environmental Studies", Khanna Publishers, New Delhi, 2006.
- [6] Kurian Joseph & R Nagendran, "Essentials of Environmental Studies", Pearson Education Publishers, 2005.
- [7] A.K Dee, "Environmental Chemistry", New Age India Publications
- [8] BharuchaErach, "Biodiversity of India", Mapin Publishing Pvt.Ltd.

E-resources and other digital material:

[1]	https://www.	ugc.ac.in/oldpdf/modelcurriculum/env.pdf		
[2]	NPTEL	Courses-Environmental	Studies	By
	Dr.TusharBa	nerjeeDeviAhilyaViswavidyalaya, Indore		

23EE3651-Python Programming

Course Category:	Skill Enhancement Course	Credits:	1
Course Type:	Lab	Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:	20ES1103Programmingfor Problem Solving20ES1152ProgrammingforProblemSolvingLaboratory	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Implement python programming constructs to build small to large applications.
CO2	Implement the problems in terms of real-world objects using OOPs concept.

CO3 Evaluate and handle the errors during runtime involved in a program.

CO4 Extract and import packages for developing different solutions for real time problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		2						2			3	2	1
CO2	3	2	2						2			3	1	2
CO3	2	2	2						2			3	3	2
CO4	2	2	2						2			3	3	1

COURSE CONTENT

Week 1 (T) Variables, Expressions & Statements: Variables, Variable names & keywords, Operators & operands, Expressions, Order of operations, Modulus Operator, String Operations. Week 1(P): Fundamental programs

Running instructions in Interactive interpreter and a Python Script Write a program to purposefully raise Indentation Error and Correct it

Week 2 (T): Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, exceptions using try and except, Short circuit evaluation of logical expressions.

Week 2(P): Operations

Develop Python programs using basic operations in Python

Week 3 & 4(T): The while statement, Infinite loops, "Infinite loops" and break, finishing iterations

with continue, Definite loops using for.

Week 3 & 4(P): Conditional & Control Flow

Develop Python programs that makes use of conditional and control flow structures

Week 5&6(T): Lists, Dictionaries, Tuples, Strings, Sets

Week 5&6(P): Lists, Dictionaries, Tuples, Strings, Sets

Week 7&8(T) Functions: Function Calls, Built-in functions, type conversion functions, random numbers, math functions, adding new functions, definition and uses, flow of execution, parameters & arguments, fruitful and void functions, why functions?, recursion, scope of a variable.

Week 7&8: Functions

Develop Python programs using recursive and non-recursive functions

Week 9&10(T): Modules: Packages small description about modularity, Third Party Packages, A brief tour of standard library, command line arguments, Error output redirection and program termination, String pattern matching, Mathematics, Internet Access, Dates & times, Data Compressions

Week 9&10(P): Modules

Illustrate installing packages via PIP and develop python programs using modules

TEXT BOOKS

[1] .Hans Petter Langtangen,"A primer on scientific programming with python",springer,5th edition,2016

[2]. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson India, 2017.

[3]. Charles Severance, " Python for Informatics- Exploring Information", Shroff

Publishers 1stedition, 2017.

REFERENCE BOOKS

[1]. Mark Lutz, "Learning Python", 5th edition, Orielly, 2013.

[2]. Allen Downey "*Think Python, How to Think Like a Computer Scientist*",2nd edition, Green Tea Press, 2015.

[3]. W.Chun, "Core Python Programming", 2nd edition, Prentice Hall, 2006.

[4]. Kenneth A. Lambert, "Introduction to Python", 1st edition, Cengage Learning, 2011.

E-RESOURCES AND OTHER DIGITAL MATERIAL

- [1].Charles Severance: University of Michigan,Python for Everybody [COURSERA]. (05-01-2021), Available: <u>https://www.coursera.org/</u>
- [2].Prof. SudarshanIyengar, IIT Ropar, Prof. Yayati Gupta, IIIT Dharwad, The Joy Of Computing Using Python [NPTEL], (05-01-2021),

Available: https://nptel.ac.in/courses/106/106/106106182/#

[3].Charles Russell Sevarance, University of Michigan, Python for Everybody, 2019 https://www.coursera.org/learn/python

23EE3352-ELECTRICAL MACHINES-I LABORATORY

Course Category:	Program Core Lab	Credits:	1.5
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	BEE workshop	Continuous Evaluation:	30M
	(23ES1153)	Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes														
	Upon successful completion of the course, the student will be able to:													
CO1	Design and conduct experiment.													
CO2	2 Analyze and present experimental results.													
CO3	CO3 Exhibit professional behavior													
Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2	3	1				3				3	2
CO2	CO2 2 3 3 2 3													
CO3	O3 1 2 2 3 1 1													
Cou	Course Content													

PART-A: DC Machines:

- 1. Open circuit characteristics of a separately excited DC generator.
- 2. Load characteristics of a separately excited DC generator
- 3. Load characteristics of a DC shunt generator
- 4. Load characteristics of a DC series generator
- 5. Speed control of DC shunt motor
- 6. Brake test on DC compound motor.
- 7. Brake test on DC series motor.
- 8. Swinburne's Test on DC shunt motor.

PART-B: Transformers:

- 1. Open circuit and short circuit tests on single phase transformer.
- 2. Sumpner's test on single phase transformers.
- 3. Parallel operation of single phase transformers.
- 4. Load test on three phase transformer.
- 5. Scott connection of three phase transformers.
- 6. Vector grouping of three phase transformers.

Note:

1. A minimum of 10 experiments are to be completed.

(Minimum of 2 simulation experiments are to be performed from each Part) Students are encouraged to do experiments with virtual labs.

23EE3353- ELECTRONIC CIRCUITS LAB

Course Category:	Professional Core	Credits:	1.5
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	BEE workshop (23ES1153)	Continuous Evaluation:	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Cour	Course outcomes													
	Upon successful completion of the course, the student will be able to:													
CO1	Design and conduct experiment.													
CO2	Analyze and present experimental results.													
CO3	D3 Exhibit professional behavior.													
Cont (1- L	Contribution of Course Outcomes towards achievement of Program Outcomes (1- Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1		3	2									2
CO2	CO2 3 3 1 2											2		
CO3				3				1						2
a														

Course Content

LIST OF EXPERIMENTS

- 1. Electronic components testing (Diode, Transistors, LED, Photo- Diode, Capacitor nomenclature, ICs, color coding of resistors) and CRO Basics.
- 2. Demo of making PCB using screen printing.
- 3. PCB Design –I (Schematic).
- 4. PCB Design –II (Rooting).
- 5. PCB Design –III (Etching Process).

PART-A: Electronics Devices Lab

- 1. Characteristics of PN junction diode.
- 2. Characteristics of Zener diode.
- 3. Characteristics of LED and photo diode.
- 4. Analysis of half wave rectifiers with and without capacitor filter.
- 5. Analysis of full wave rectifiers with and without capacitor filter.
- 6. Characteristics of transistor in Common Base configuration.
- 7. Characteristics of transistor in Common Emitter configuration.
- 8. Verification of transistor self-bias circuit.
- 9. Characteristics of Junction Field Effect Transistor.
- 10. Characteristics of uni-junction transistor.

PART – B: Digital Electronics Lab

- 1. Realization of logic gates using discrete components and universal gates.
- 2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
- 3. Design of binary to gray and gray to binary converters.
- 4. Verification of flip-flops using logic gates.
- 5. Implementation of 4-bit parallel Adder/ Subtractor using IC 7483.
- 6. Design of BCD to 7-segment display driver.
- 7. Design and Verification of Shift registers.
- 8. Design of modulo N counter.
- 9. Design of 1-bit Arithmetic Logic Unit (ALU).
- 10. Design and verification of synchronous and asynchronous counters using flip flops and IC 74163.

NOTE:

- 1. A minimum of **ten** experiments are to be completed.
- 2. Minimum Five from PART-A and PART-B are to be completed.

SEMESTER-IV

S.No.	Category	Course code	Course title	L/D	т	Р	Credit
1	Management Course	23HS4101	Engineering Economics and Management	2	0	0	s 2
2	Engineering Science	23ES4102D	Electrical Measurements and Sensors	2	0	2	4
3	Professional Core 23EE4303		Electrical Machines-II	3	0	0	3
4	Professional Core	23EE4304	Linear Control Systems	3	0	0	3
5	Professional Core 23EE4305		Linear Integrated Circuits & Applications	3	0	0	3
6	Soft Skill-2	23TP4106	English for Professionals	0	0	2	1
7	Skill Enhancement Course	23EE4651	Data structures using Python	0	0	2	1
8	Engineering Science	23ES4152	Design Thinking & Innovation	1	0	2	2
9	Professional Core	23EE4353	Electrical Machines-II lab	0	0	3	1.5
10	Professional Core 23EE4354		Linear Integrated Circuits Lab	0	0	3	1.5
Total				14	0	14	21

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation

Category	Credits
BS & H Courses	2+2=4
Engineering Science	3
Professional core	3+3+3+1.5+1.5=12
Soft skill	1
Skill oriented courses	1
TOTALCREDITS	21

20HS4101 - ENGINEERING ECONOMICS AND MANAGEMENT

Course Category:	Humanities & Social Science	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1 Understand various forms of organizations and principles of management.

CO2 Understand the various aspects of business economics.

CO3 Acquire the knowledge on human resources and marketing functions.

CO4 **Evaluate** various alternatives economically.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2										2			
CO2	2	3									2			
CO3	2										2			
CO4	2	3									2			

Course Content

UNIT-I

[Text Book-1&2]

Forms of Business Organization: salient features of sole proprietorship, partnership, joint stock company, private limited and public limited companies, co-operative society and public sector. **Management:** Introduction to management, functions of management, principles of scientific management, modern principles of management.

UNIT-II

[Text Book-1&2]

Introduction to Economics: Introduction to basic economic concepts, utility analysis, marginal utility and total utility, law of diminishing marginal utility, law of equi-marginal utility.

Demand Analysis: Theory of demand, demand function, factors influencing demand, demand schedule and demand curve, shift in demand, elasticity of demand, elastic and inelastic demand, types of elasticity.

Supply Analysis: Supply schedule and supply curve, factors influencing supply, supply function. factors of production, production function, production with one variable input, isoquants, returns to scale, cost function: cost-output relationship in short run and long run, relationship between AC and MC. Supply analysis, supply schedule and supply curve, factors influencing supply, supply function, theory of firm: price determination under equilibrium of

firm, perfect competition.

National Income, Money and Banking, Economic Environment:

National income concepts, GNP, NNP, methods of measuring national income, inflation, deflation, kinds of money, value of money, functions of bank, types of bank, economic liberalization, privatization, globalization.

UNIT-III

[Text Book -1&2]

Human Resource Management: Meaning and difference between personnel management and human resource management, functions of human resource management.

Marketing Management: Concept of selling and marketing, differences, functions of marketing, product life cycle, concept of advertising, sales promotion, types of distribution channels, marketing research, break, even analysis, problems.

UNIT-IV

[Text Book-1&2]

Financial management: Functions of financial management, time value of money with cash flow diagrams, concept of simple and compound interest.

Depreciation: causes of depreciation, factors influencing depreciation, common methods of depreciation: straight line method, declining balance method, sum of year's digits method, problems.

Economic Alternatives: Methods of evaluating alternatives under present worth method, future worth method, annual equivalent method - problems

Text Books:

- [3] M. Mahajan "Industrial Engineering and Production Management", Dhanpat Rai Publications, 2nd edition, 2015
- [4] Martand Telsang "Industrial & Business Management" S.Chand publications, 2001

Reference Books:

- [1] Philip Kotler & Gary Armstrong "Principles of Marketing", PHI, New Delhi, 2012.
- [2] B.B Mahapatro, "Human Resource Management", New Age International, 2011.
- [3] IM Pandey, "Financial Management" Vikas Publications 11th edition
- [4] R. Panneerselvam, "Production and operations management", PHI, New Delhi, 2012.

E-resources and other digital material:

- [1] <u>https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/</u>
- [2] <u>https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html</u>
- [3] <u>http://productlifecyclestages.com/</u>
- [4] <u>https://speechfoodie.com/cash-flow-diagrams/</u>

23ES4102B-ELECTRICAL MEASUREMENTS AND SENSORS

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-2
Prerequisites:	Engineering Physics (23BS2102A)	Continuous Evaluation:	30M
	Electrical Circuit Analysis-I	Semester End Evaluation:	70M
	(23ES2104E)	Total Marks:	100M

Course	outco	omes												
	Upor	Upon successful completion of the course, the student will be able to:												
CO1	Elucidate the basic laws governing the operation of electrical measuring instruments and measure electrical quantities like voltage, current and power.													
CO2	Explain the time and frequency measurement techniques for digital meters.													
CO3	Appl	Apply principles of CT and PT for measurement of electrical quantities.												
CO4	Appl under	Apply the concepts of signal conditioning circuit for various transducers and understand the concept of Digital Storage oscilloscopes.												
Contril (1 - Lo	oution w, 2 -	of Co Medi	ourse ium, 3	Outec 3 - Hig	omes t gh)	oward	ds ach	ieven	nent o	f Prog	ram C	utcom	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3 3 2 1 2 2												
CO2	3	3		3								1	2	
CO3	3	3	2	3										2

Course Content

3

3

2

2

UNIT-I

CO₄

[Text Book-1]

2

1

Analog Instruments: Classification of analog Instruments, principles of operation, electromechanical indicating instruments – operating forces, control systems, damping systems. Analog Ammeters, Voltmeters and Wattmeter: Permanent magnet moving coil instruments, moving iron instruments, electrodynamometer wattmeter (construction, general torque equation, shape of scale, advantages, disadvantages and errors).

UNIT-II

[Text Book-2]

Philosophy of digital measurements, software controlled measurements

Digital Time and Frequency Measurement Techniques: Measurement of time interval between two events, error in time interval measurement, resolution, measurement of periodic time, measurement of frequency, ratio of two frequencies, high frequency measurement, power system frequency deviation measurement.

Digital Meters:

Capacitance measurement using exponential discharging, phase measurement, requirements of an ideal phase meter, dual slope voltage to time conversion.

UNIT-III

Instrument Transformers: Introduction, Advantages and disadvantages of instrument transformers.

Current Transformers-Theory, Ratio error and phase angle errors, effect of Secondary open circuit, Methods to reduce errors in current transformers.

Potential Transformers-Theory, Ratio error and phase angle errors, Methods to reduce errors in potential transformers.

UNIT-IV

Special Sensors:

Introduction, Smart sensors, Micro sensors, IR radiation sensors, Ultrasonic sensors, Fiber optic sensors, LVDT, Temperature and Bio sensors

Digital Storage Oscilloscopes:

Principle of operation, Waveform recognition, Comparison between analog and Digital storage oscilloscopes, Accessories of Cathode Ray oscilloscope: Calibrators, Probes, Cameras, Electronic switch

LIST OF EXPERIMENTS.

Sensors and measurements

- 1. .Data acquisition from energy meter using RS232/RS485.
- 2. Measurement of power and energy in digital meters with CTs
- 3. Measurement of strain using strain gauge and temperature measurement using LM35 & thermistor.
- 4. Speed measurement using magnetic sensor and displacement measurement using inductive pickup
- 5. Measurement of ratio error and phase angle error of C.T.
- 6. Measurement of displacement using LVDT and characteristics of hall-effect sensor Characteristics of (resistive and thermo e.m.f.) temperature sensor, and piezoelectric system
- 7. Study and observe the oscilloscope as a test and measuring instrument.(Test the resistors, capacitors, diodes, transistors and measure AC/DC voltages, frequency, phase and study the Lissajous patterns).
- 8. Simulation of CRO, function generator and spectrum analyzer using analog discovery kit.

Text Books:

- [1] A.K.Sawhney, "A course in Electrical & Electronic Measurements and Instrumentation", DhanapthRai& Co., New Delhi, 19th edition, 2013.
- [2] T.S.Rathore, *Digital measurement Techniques*, Narosa Publishing house, 1996.
- [3] D.V.S.Murty, "Transducers & Instrumentation", Prentice Hall of India, 2nd edition, 2013

Reference Books:

- [1] H.S.Kalsi, "*Electronic Instrumentation*", Mc. Graw Hill Education, New Delhi, 3rd edition, 2018.
- [2] J.B.Gupta, "A course in Electronic & Electrical Measurements and Instrumentation", S. K. Kataria& Sons, New Delhi, 2009.
- [3] E.W.Golding and F.C.Widdis, "Electrical Measurements and measuring instruments",

[Text Book-3]

[Text Book-1]

[Text Book-1 & 2]

Wheeler Publishers, New Delhi, 5thedition, 2009.

E-resources and other digital material [1] http://nptel.ac.in/syllabus/108106070/

23EE4303–LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Electronic Circuits- (20EE3302) Network Theory-I & II (23PC2104D, 20EE3304)	Continuous Evaluation: Semester End Evaluation: Total Marks:	30M 70M 100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1 Understand the concepts of op-amps and its applications.

CO2 **Explain** different non-linear op-amp circuits and waveform generators.

CO3 Analyze active filters, ADCs and DACs.

CO4 Analyze timer circuits, PLL and voltage regulators.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2					3					2
CO2	3			3					3					2
CO3	3			2					3					2
CO4	3			2										2

Course Content

UNIT-I

[Text Book-1&2]

Operational Amplifiers: Integrated circuits-types, classification, package types and power supply connections, operational-amplifier block diagram, ideal and practical operational-amplifier, Operational-amplifier characteristics-DC and AC characteristics. frequency response and slew rate

Linear Applications of Operational Amplifiers: Negative feedback concept in operational-amplifiers, inverting and non-inverting amplifier, voltage follower, differential amplifier, summing amplifier, instrumentation amplifier, integrator and differentiator.

UNIT-II

[Text Book-1&2]

Non-Linear Applications of Operational Amplifiers: Sample and hold circuit, precision diode, Precision full wave rectifier, peak value detector, clipper and clamper circuit.

Comparators and Waveform Generators: Introduction to comparator, basic comparator, applications-zero-crossing detector, window detector, waveform

generators- Schmitt trigger, square-wave generator, triangular wave generator.

UNIT-III

[Text Book-1&2]

Active Filters: Active low pass and high pass filters, wide band pass filter, band stop filters, notch filter and all pass filters.

D/A and A/D Converters: Introduction, basic digital to analog converter techniquesweighted resistor digital to analog converter, R-2R ladder D/A converter; A/D conversion– parallel comparator type analog to digital converter, successive approximation analog to digital converter and dual slope analog to digital converter

UNIT-IV

[Text Book-1&2]

Applications of Special ICS: 555 Timer-As mono-stable and astable multi-vibrators, voltage controlled oscillator(IC566); phase locked loops- operating principles, monolithic PLLs, IC voltage regulators-Fixed voltage regulators- LM78XX, LM79XX; variable voltage regulators – LM317, LM723IC

Text books:

- [1] Rama Kant A. Gayakwad, "*Operational amplifiers and Linear Integrated Circuits*", Prentice Hall India Pvt. Ltd.,4th Edition ,2012
- [2] Roy Choudhry and Shail B. Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd, 4th Edition,2011.

Reference Books:

[1] Jacob, "Applications and Design with Analog Integrated Circuits", Prentice Hall India Pvt. Ltd. Latest Edition.

[2] Denton J Dailey, "Operational Amplifiers and Linear Integrated Circuits: Theory and Applications", McGraw Hill Ltd, Latest Edition.

E-resources and other digital material:

[1] https://nptel.ac.in/courses/117101106

23EE4304-LINEAR CONTROL SYSTEMS

Course Category:	Program Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:	Electrical Circuit	Continuous Evaluation:	30M
	Analysis-I (23PC2104D)	Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes														
	Upon successful completion of the course, the student will be able to:													
CO1	Determine transfer function models of electrical, and mechanical systems													
CO2	Analyze the behavior of the system under time domain approach and graphical method.													
CO3	Apply graphical methods to analyze the behavior of the system under frequency domain approach.													
CO4	O4 Analyze state space models of various systems													
Cont (1 - 1	ributi Low, 2	on of 2 - Me	Cours edium	e Outo , 3 - H	comes ligh)	s towa	rds ac	hieve	ment	of Prog	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3	1								1	2	2
CO2	02 3 3 1 1 2 2											2		
CO3	3		3	1								1	2	2
CO4	3		3	1								1	2	2

Course Content

UNIT-I

[Text Book-1]

Introduction: Control system terminology, open loop and closed loop control systems, effect of feedback on overall gain, stability, sensitivity, external noise, types of feedback control systems – linear, nonlinear, time invariant and time varying systems.

Mathematical Models of Physical Systems: Modeling of mechanical and electrical systems, analogous systems, transfer functions of mechanical, electrical and electro-mechanical systems, characteristic equation of feedback systems, poles and zeros, block diagram- definition, reduction rules, signal flow graph- definition, Mason's gain formula.

UNIT-II

[Text Book-1]

Time Response Analysis: Standard test signals-step, ramp, parabolic and impulse, time response of first-order system to standard test signals, second order systems- unit step response of second order under damped system, time domain specifications ,steady state errors and static error constants.

Stability Analysis in Complex Plane: stability definitions, stability study based on location of poles, Routh–Hurwitz criterion, root locus technique- definition, construction rules and problems.

(For positive values of K only).

Basic Controllers: P, I, PI, PD and PID control actions.

UNIT-III

[Text Book-1] Frequency Domain Analysis: Introduction, frequency domain specifications, correlation between time and frequency responses, bode plots, polar plots, phase margin and gain margin, principle of argument, Nyquist stability criterion.

UNIT-IV

[Text Book-1&2]

State Space Analysis: Concepts of state, state variables, state model, state space representation using physical variables with basic electrical and mechanical systems, solution of state equations, computation of state transition matrix- infinite series method, Laplace transform method, transfer function from state model, eigen values and stability analysis, controllability and observability of linear systems.

Text Books:

- [1] A. Anand Kumar, "Control Systems", Prentice Hall of India Private Ltd, Delhi, 2nd edition, 2014.
- [2] I.J.Nagrath&M.Gopal, "Control Systems Engineering", New Age International (P) publishers, 5th edition, 2009.

Reference Books:

- [1] K. Ogata, "Modern Control Engineering", Prentice Hall of India publishers, 5th edition. 2010.
- [2] B.C. Kuo, "Automatic Control Systems with MATLAB programming", Prentice Hall of India publishers, 7th edition, 2015.
- [3] Schaum's Series, "Feedback and control systems", Tata McGraw Hill (Pvt.) Ltd., 2nd edition.

E-resources and other digital material

[1]www.nptel.ac.in/courses/108101037/

[2] www.dis.uniroma1.it/~lanai/controlsystems/cs_lectures_enhtml

23EE4305-ELECTRICAL MACHINES-II

Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	Electrical Machines-I	Continuous Evaluation:	30M
	(20EE3303)	Semester End Evaluation:	70M
		Total Marks:	100M

Cour	Course outcomes													
	Upoi	n succ	essful	comp	letion	of the	e cour	se, the	e stud	ent wil	l be al	ole to:		
CO1	Und gene	erstar rators	nd the	const	tructio	onal d	etails	and p	rincip	le of c	operati	on of	synchr	onous
CO2	Analyze the performance of the synchronous motor and its applications.													
CO3	Understand the constructional details and principle of operation of three phase AC induction motor and speed control methods.													
CO4	Analyze the starting methods of single phase AC induction motor and performance of special electrical machines.													
Cont (1 - 1	Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3			3						3	3
CO2	3	3	2	3			3						2	2
CO3	3 3 2 3 3 3 3													
CO4	3	3	2	2			3						2	2
CO4	3 3 2 3 3 3 3 3 3 3 2 2 3 2 2 2													

Course Content

UNIT-I

[Text Book-2]

Synchronous Generators: Construction, types of rotors, working principle, winding factors, EMF equation, armature reaction, phasor diagram of non-salient pole synchronous generator under no-load and loaded conditions, voltage regulation, direct load, EMF, and MMF methods, synchronization of alternator with infinite bus, effect of variation of excitation and mechanical input, efficiency of the synchronous generator.

UNIT-II

[Text Book-2] Synchronous Motor: Principle of operation, starting methods, torque equation, phasor diagram, different torques, effects of varying excitation, minimum and maximum power for a given excitation, V and inverted V curves, efficiency, application of synchronous motors as condenser

UNIT-III

[Text Book-1]

Three Phase Induction Motors: Construction, rotating magnetic field, operation of squirrel cage and slip ring motors, torque equation, torque-slip characteristics, equivalent circuit, losses and efficiency, speed control, stator voltage control, v/f control, induction generator.

UNIT-IV

[Text Book-1]

Single Phase Induction Motors: Construction, double field revolving theory, equivalent circuit, no-load and blocked rotor tests, starting methods, split phase, capacitor start and run motor.

Special Machines: Principle of operation and characteristics - Permanent Magnet Synchronous Motor, BLDC motor, SRM, stepper motors.

Text Books:

- [1] I.J.Nagrath and D.P. Kothari, "*Electric Machines*", Tata McGraw Hill Education Private Limited,4th edition, 2010.
- [2] Ashfaq Husain, "*Electric Machines*", DhanpatRai& Co. (Pvt.) Ltd, 2nd edition, 2009.

Reference Books:

- [1] Dr. P. S. Bhimbra, "Electrical Machinery", Khanna Publications, 7thedition, 2007.
- [2] A.E Fitzgerald and Charles Kinsley, "*Electric Machinery*", TMH s Publications, 6thedition, 2002.
- [3] Alexander S.Langsdorf, "*Theory of Alternating- Current Machinery*" Tata McGraw-Hill Publications, 2001.
- [4] J.B Gupta, "Theory & Performance of Electrical Machines", S.K.Kataria& Sons, 15th edition, 2015.

E-resources and other digital material

[1] http://nptel.ac.in/courses/108105017/

23TP4106 - ENGLISH FOR PROFESSIONALS

Course Category:	Institutional Core Soft skill-2	Credits:	1
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-2
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing.	Continuous Evaluation: Semester End Evaluation: Total Marks:	100M 0M 100M

Course outcomes														
	Upo	n succ	essfu	l com	pletio	n of tl	he cou	irse, tl	he stu	dent w	ill be a	able to:	:	
CO1	Unde	erstand	how t	o liste	n, refle	ect, and	d speal	k while	e comr	nunicat	ing wit	h others	5.	
CO2	Reca comr	ll the nunica	fund tion.	ament	als of	f lang	guage	in te	erms (of gra	mmar	and v	ocabula	ry in
CO3	Apply English language skills in various speaking contexts to present ideas with clarity and accuracy.													
CO4	4 Analyze the different parts in Versant Test and answer them.													
Cont (1 - I	ributi Low, 2	on of 2 - Me	Cours edium	e Out , 3 - F	come Iigh)	s towa	ards a	chieve	ement	of Pro	ogram	Outcor	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									3		2		
CO2	2									3		2		
CO3	2	2 2 3 2												
CO4	2 3 2													
		,					,				,	,		

Course Content

1. Conversation Starters

Introduction ,Seeking Permissions - Asking for Directions – Making Requests – Offering Help – Expressing Thanks – Conveying Apologies – Starting a Conversation with a Stranger – Practice.

2. Functional Conversations

Introducing Self – Introducing Others – Starting a Group Introduction – Icebreaker Introduction – Introducing a Formal Setting – Practice Exercises.

3. Grammar

Verbs – Tenses – Sentence Structures – Spotting the Errors.

4. Just A Minute

Introduction – Significance – Fluency – Coherence – Avoiding Errors – Communication Skills – Confidence – Practice.

5. Vocabulary

Idioms - Phrases - Significance - Meanings - Usage - Practice.

6. Elocution

Definition – Importance – Key Components – Voice Modulation – Articulation – Posture and Gestures – Practice.

7. Extempore

Introduction – Significance – Developing Quick Thinking – Communication Skills – Confidence – Practice.

8. Debate

Introduction – Understanding the Structure – Purpose of a Debate – Developing Basic Debating skills – Do's and Don'ts – Practice.

9. Versant Test

Overview of the Versant Test – Purpose and Importance – Format of the Test – Types of Questions – Practice.

10. Story Telling

Know Your Audience – Choose a Story – Set the Scene – Introduce the Characters – Build Suspense – Describe the Conflict – Show the Resolution – Share the moral/message – Use Vivid Language – Practice Delivery – Invite Reflection/Discussion – Follow Up.

Learning Resources

[1] English for Professionals Lab Manual

Reference Books

[1] Wren & Martin, "English Grammar and Composition", S.Chand& Company, 2023.

- [2] Dale Carnegie,"The Quick and Easy way to Effective Speaking", Rupa Publications, 2016.
- [3] Richard A. Spears" *McGraw-Hill's Dictionary of American Idioms and Phrasal Verbs*", McGraw Hill, 2005.
- [4] Kamalesh Sadanand," A Spoken English",. Vol 1 & 2, Orient BlackSwan, 2nd Edition, 2014.

E-Resources

[1] <u>https://www.pearson.com/languages/hr-professionals/versant.htmlSoftx</u>

- [2] <u>https://www.ted.com/talks</u>
- [3] https://shortstoryproject.com/

23EE4651 – DATA STRUCTURES USING PYTHON

Course Category:	Skill enhancement course	Credits:	1
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-2
Prerequisites:	23EE3307-Python	Continuous Evaluation:	30M
	Programming	Semester End Evaluation:	70M
		Total Marks:	100M

Cour	se ou	tcome	es											
	Upo	n succ	essfu	l com	pletio	n of tl	ne cou	irse, tl	ne stu	dent w	ill be a	uble to:		
CO1	Unde	erstand	basic	data st	ructur	es in p	ython	like L	ists, Tu	uples, D	oictiona	ries, Se	ts and I	Maps
CO2	Design and analyze simple linear data structures.													
CO3	Design and analyze on linear data structures.													
CO4	4 Gain knowledge in practical applications of data structures													
Cont (1 - I	Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2					3		3		2	2
CO2	3	2							3		3		2	2
CO3	3 3 2 3 3 3 2 2												2	
CO4	4 3 2 3 2 2													
								-		,				

Course Content

- 1. Write a Python program for class, Flower, that has three instance variables of type str, int, and float that respectively represent the name of the flower, its number of petals, and its price. Your class must include a constructor method that initializes each variable to an appropriate value, and your class should include methods for setting the value of each type, and retrieving the value of each type.
- 2. Develop an inheritance hierarchy based upon a Polygon class that has abstract methods area() and perimeter(). Implement classes Triangle, Quadrilateral, Pentagon, that extend this base class, with the obvious meanings for the area() and perimeter() methods. Write a simple program that allows users to create polygons of the various types and input their geometric dimensions, and the program then outputs their area and perimeter.
- 3. Write a python program to implement method overloading and method overriding.
- **4.** Write a Python program to illustrate the following comprehensions:

a) List Comprehensions b) Dictionary Comprehensions

c) Set Comprehensions d) Generator Comprehensions

- 5. Write a Python program to generate the combinations of n distinct objects taken from the elements of a given list. Example: Original list:[1,2,3,4,5,6,7,8,9] Combinations of two distinct objects: [1,2] [1,3][1, 4][1, 5] [7,8][7, 9][8,9].
- 6. Write a program for linear search and binary search.
- 7. Write a program to implement bubble sort and selection sort.
- 8. Write a program to implement merge sort and quick sort.
- 9. Write a program to implement stacks and queues.
- **10.** Write a program to implement singly linked list.
- **11.** Write a program to implement doubly linked list.
- **12.** Write a program to implement binary search tree.

Reference Books

[1] Rance D. Necaise, "Data Structures and Algorithms Using Python", , John Wiley & Sons.

[2] Reema Thareja, "*Python Programming using Problem Solving Approach*", Oxford Higher Education,1st edition.

E-Resources:

[1] <u>https://www.udemy.com/course/data-structures-and-algorithms-bootcamp-in-python</u>

[2] https://onlinecourses.nptel.ac.in/noc22_cs26/preview

[3] https://www.classcentral.com/course/freecodecamp-data-structures-and-algorithms-in-

python-full-course-for-beginners-57034

23ES4152–DESIGN THINKING & INNOVATION

Course Category:	Engineering Sciences	Credits:	2
Course Type:	Activity Based Learning	Lecture-Tutorial-Practice:	2-0-0
Prerequisites:	Social Needs, Customer needs &	Continuous Evaluation:	30M
	market needs	Semester End Evaluation:	70M
		Total Marks:	100M

Cou	rse ou	tcome	S											
	Upor	n succ	essful	comp	letion	of the	e cour	se, the	e stud	ent wil	ll be al	ole to:		
CO1	Able	to defi	ne bas	ic desi	gn con	nponer	its, De	sign th	inking	compo	nents a	and pro	cess	
CO2	Apply the design thinking techniques for solving problems in various sectors.													
CO3	Analyze to work in a multidisciplinary environment.													
CO4	4 Evaluate the value of creativity.													
Cont (1 - 1	tributi Low, 2	on of 2 - Me	Cours edium	e Outo , 3 - H	comes ligh)	s towa	rds ac	hieve	ment	of Prog	gram (Dutcon	nes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
													i	

Course Content

UNIT –I

CO4

Introduction to Design Thinking & Design Thinking Process: Introduction to elements and principles of design components, introduction to design thinking, history of design thinking, new materials in industry, 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, brainstorming, product development.

Activity: Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. every student should explain about product development.

UNIT – II

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.

Activity: Debate on innovation and creativity, flow and planning from idea to innovation, debate on value-based innovation.

UNIT - III

Product Design: Problem formation, introduction to product design, product strategies, product value, product planning, product specifications. Innovation towards product design Case studies. **Activity:** Importance of modeling, how to set specifications, Explaining their own product design.

UNIT- IV

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.

Activity: How to market our own product, about maintenance, reliability and plan for startup.

Text Books:

[1]. Tim Brown, Harper Bollins, "Change by Design "Harper collins e-book, 1st edition, 2009.

[2]. Idris Mootee," Design Thinking for Strategic Innovation", Adams Media ,1st edition, 2014 .

Reference Books:

- [1] .David Lee, "Design Thinking in the Classroom", Ulysses press, 2018.
- [2] .Shrrutin N Shetty, "Design the Future", Norton Press, 1st edition 2018.
- [3] .William lidwell, Kritinaholden, & Jill butter, "Universal principles of design", Rockport Publishers, 2nd edition, 2010.
- [4] .Chesbrough.H, "The era of open innovation", 2003

E-resources and other digital material:

[1] https://nptel.ac.in/courses/110/106/110106124/

[2] https://nptel.ac.in/courses/109/104/109104109/

[3] https://swayam.gov.in/nd1_noc19_mg60/preview

https://onlinecourses.nptel.ac.in/noc22_de16/preview

23EE4353-ELECTRICAL MACHINES-II LAB

Course Category:	Professional Core	Credits:	1.5
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	Electrical Machines-II	Continuous Evaluation:	30M
	Lab (20EE3352)	Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes

Upon successful completion of the course, the student will be able to:

CO1 **Design** and conduct experiment.

CO2 Analyze and present experimental results.

CO3 **Exhibit** professional behavior.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3			3	2	3		3	3	
CO2	2	2	3	3	3			3	2	3			3	
CO3			3					3	2	2				

Course Content

- 1. Regulation of 3-phase alternator by EMF and MMF methods
- 2. Load test on 3-phase alternator.
- 3. Synchronization of three phase alternator with infinite bus bar.
- 4. Slip test and V & inverted V curves of 3-phase synchronous motor.
- 5. No load and blocked rotor tests on 3-phase induction motor(equivalent circuit &circle diagram)
- 6. Load test on 3-phase squirrel cage/Slip ring induction motor.
- 7. Load test on Induction generator.
- 8. Determination of equivalent circuit of single phase induction motor.
- 9. Simulation of three phase alternator to analyze the performance characteristics.
- 10. Simulation of $1-\Phi/3-\Phi$ squirrel cage induction motor to analyze the performance characteristics
- 11. Modeling and simulation of three phase Induction motor.
- 12. Simulation for speed control of $3-\Phi$ squirrel cage induction motor(pole changing, variable voltage, rotor resistance in slip ring)

NOTE: (A minimum of **ten** experiments are to be completed in which minimum two simulation experiment mandatory.)

23EE4354 –LINEAR INTEGRATED CIRCUITS LAB

Course Category:	Program Core	Credits:	1.5
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	LICA-23EE4305	Continuous Evaluation:	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Cour	Course outcomes													
	Upoi	n succ	essful	comp	letion	of the	e cour	se, the	e stud	ent wil	l be al	ole to:		
CO1	Desig	gn and	condu	ct expe	erimen	t.								
CO2	Evaluate and Analyze experimental results.													
CO3	Exhibit professional behavior.													
Cont (1 - 1	Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2 - Medium, 3 - High)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3			3	2	3		3		3
CO2	2	2	3	3	3			3	2	3				3
CO3			3					3	2	2				

Course Content

List of Experiments:

- 1. Measurement of op-amp parameters.
- 2. Applications of op-amp inverting amplifier, adder, subtractor, comparator.
- 3. Design a precision full wave rectifiers using Op-Amp 741IC
- 4. Design of integrator & differentiator using op-amp.
- 5. Realization of instrumentation amplifier using op-amp.
- 6. Design a waveforms generator (square &triangular)using op-amp.
- 7. Design of clipper and clamper circuits using op-amp.
- 8. Design of active filters using op-amp (LPF & HPF-first order).
- 9. IC 555 timer as mono-stable and astable operation.
- 10. IC 565 PLL applications.
- 11. Realization of voltage regulators using IC 7805 , IC 7905 and IC 723 $\,$
- 12. Design a D/A converter using 3 bit R-2R ladder circuit.

Note: - Realizing all the above experiments using different types of ICs.