Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Department: Electronics & Computer Engineering **Rev:** Course Structure/01/NEP/2023-24

Class: S.Y. B. Tech **Semester:** III

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23EC2301	PCC	Analog Electronics	3	-	-	3	10	10	30	50	100	3
23EC2302	VSEC	Engineering Mathematics III	3	-	-	3	10	10	30	50	100	3
23EC2303	PCC	Data structure	3	-	-	3	10	10	30	50	100	3
23EC2304	PCC	Analog Electronics Laboratory	-	-	2	2	15	15	-	20	50	1
23EC2305	PCC	Data Structure Laboratory	-	-	2	2	15	15	-	20	50	1
23EC2306	PCC	Simulation Laboratory	-	-	2	2	15	15	-	20	50	1
23EC2307	EEM	Employability and Skill Development	2	-	-	2	25	25	-	-	50	2
23EC2308	VEC	Environmental Science	2	-	-	2	25	25	-	-	50	2
23EC2309	CEP	Mini Project – II	-	-	2	2	25	25		-	50	1
23ECMDXX	MDM	Multidisciplinary Minor	2	-	-	2	10	10	30	50	100	2
23OEEC21	OE*	Open Elective-I	2	-	-	2	10	10	30	50	100	2
23HSSM01	VEC	Aptitude Skills – I	1	-	-	1	25	25	-	-	50	1
23HSSM02	VEC	Language Skills – I	-	-	2	2	25	25		-	50	Audit
		Total	**18**	**-**	**10**	**28**	**220**	**220**	**150**	**310**	**900**	**22**

Multidisciplinary Minor -I

Biomedical Engineering (Basket A)	Data Science (Basket B)	Industrial automation (Basket C)
Electrical & Electronics Measurement (23ECMDA1)	Python Programming for Data Science (23ECMDB1)	Electrical Machines and Instruments (23ECMDC1)

Note: (OE*) Open Elective-I Course will be offered to students of other programs and will not be offered to the students of the same program.

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Analog Electronics

23EC2301	PCC	Analog Electronics	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics

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

CO1	Explain the working of different JFET amplifier configurations.
CO2	Explain the operation of MOSJFET and its applications.
CO3	Build different types of voltage regulator
CO4	Analyze different feedback amplifier configurations.
CO5	Illustrate different oscillator circuits.
CO6	Make use of IC 555 in various multivibrator circuits and other applications

Course Contents:

Unit 1: JFET: Introduction, Types of JFET, Device structure, Operation of N Channel JFET, Parameters of JFET: Drain resistance, Pinch off voltage, trans conductance, amplification factor, FET input and output characteristics, FET amplifier configurations: CS, CD, and CG, Self-Biased CS amplifier and its DC analysis	[6]
Unit 2: MOSFET: Introduction, Device Structure, Basic Operation, Types of MOSFET, Construction of n-channel E-MOSFET and D-MOSFET, E-MOSFET characteristics, Non-ideal voltage current characteristics: Body effect, Sub-threshold conduction, breakdown effects and temperature effects. MOSFET as Inverter	[6]
Unit 3: Voltage Regulators: Introduction, Need of voltage regulator, Types, Analysis and Design of Zener Shunt voltage Regulator, Transistor series and Shunt Regulator, IC voltage regulator: Introduction, voltage regulator using IC's:78XX, 79XX, LM317, IC 723	[6]
Unit 4 Feedback Amplifiers:	[6]

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General Feedback Amplifier Structure, The closed loop gain of an amplifier, Properties of Negative Feedback, Basic Feedback topologies: Voltage Series, Voltage Shunt, Current Series, and Current Shunt negative feedback amplifiers, Classification of amplifiers, Effect of feedback on terminal characteristics of amplifiers, Analysis of Voltage series feedback amplifier	
Unit 5: Oscillators: Introduction, The concept of positive feedback in amplifier, Barkhausen criterion, Classification of oscillators, RC Oscillators: RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator.	[6]
Unit 6: Multivibrators: Timmer IC 555: Introduction, internal circuitry, Pin diagram, Multivibrator: Introduction, Types of Multivibrators: Astable, Monostable and Bistable, Operation of Multivibrator circuits using IC555. Applications of IC555.	[6]
Text Books: 1. Millman Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw Hill, 2000. 2. Donald Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill.	
Reference Books: 1. David A. Bell, "ElectronicDevicesandCircuits",5thEdition, Oxford press 2. R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9thEdition, Prentice Hall of India, 2006. 3. Anil K. Maini and Varsha Agarwal "Electronic Devices and Circuits", Wiley India 4. Phillip E. Allen, Douglas R. Holberg, "CMOS Analog Circuit Design", Second Edition, Oxford. K. R. Botkar, "Integrated Circuits", 5th Edition, Khanna Publication	

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Engineering Mathematics-III

23EC2302	VSEC	Engineering Mathematics-III	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mathematics-I & II

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

CO1	Develop the concept of Fourier series expansion of different periodic functions so as to use them in harmonic analysis.
CO2	Solve problems related to Fourier transform and inverse Fourier transform.
CO3	Solve finite difference equation using Z- transform
CO4	Apply the definition & properties of Laplace Transform to evaluate the integral & to find Laplace transform of elementary functions.
CO5	Apply the knowledge of Laplace transformation to find solution of linear differentiation equations with constant coefficient.
CO6	Apply numerical integration techniques whenever and wherever routine methods are not applicable, Apply various interpolation methods and finite difference concepts.

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Course Contents:

Unit 1: Fourier series Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansions of odd and even periodic functions and half range series	[6]
Unit 2: Fourier Transforms Fourier Transforms, Fourier Sine and Cosine Transforms, Complex form of Fourier Integral, Finite Fourier Sine and Cosine Transform.	[6]
Unit 3:Z Transform Definition, properties of Z transform, Z Transform of basic sequences, Z transform of some standard discrete function, inverse Z transform, application to solve difference equation.	[6]
Unit 4:Laplace Transform Definition – conditions for existence, Transforms of elementary functions, Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, scale change property, transforms of functions multiplied by t^n, transforms of functions divided by t, transforms of derivatives; Evaluation of integrals by using Laplace transform.	[6]
Unit 5: Inverse Laplace Transform Introductory remarks, Inverse transforms of some elementary functions, General methods of finding inverse transforms, Partial fraction method and Convolution Theorem for finding inverse Laplace transforms , Applications to find the solutions of linear differential equations	[6]
Unit 6: Numerical Integration &Interpolation Numerical Integration: Trapezoidal rule, Simpson's $\frac{1}{3}^{rd}$ rule, Simpson's $\frac{3}{8}^{th}$ rule and Weddle's rule (without proof) Problems. Interpolation/extrapolation using Lagrange's formulae, Newton's forward and backward difference formulae, Newton's divided difference (All formulae without proof).	[6]
Text Books: 1. P. N. Wartikar & J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.	

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Reference Books:
1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

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Data Structure

23EC2303	PCC	Data Structure	3-0-0	3 Credits

Teaching scheme:	**Examination scheme:**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Basics of C programming.

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

CO1	Interpret the basics of data structure and its application.
CO2	Outline the concepts of array and records.
CO3	Demonstrate the concepts of Linked List and apply various operations on them.
CO4	Demonstrate concepts of stack and queue.
CO5	Make use of the concepts of Trees apply various operations on them.
CO6	Demonstrate Basic terminologies and representation of Graph.

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Course Contents:

UNIT-1: Introduction & Overview Introduction to data structures & its data types, Operations, Algorithms: complexity, time space trade-off with example.	[6]
UNIT-2: Arrays, Records Introduction, linear arrays, representation of linear array in memory, traversing linear arrays, inserting & deleting, Sorting: bubble sort, searching: linear search, binary search, Multidimensional arrays Records: Record structures, representation of records in memory, parallel arrays, matrices, sparce matrices.	[6]
UNIT 3 Linked Lists: Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists.	[6]
UNIT 4 Stacks & Queues: Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, Applications of stacks, stacks & recursion, Queue as an abstract data type representation, circular, double ended, priority, Quicksort, application of queues.	[6]
UNIT 5 Trees: Binary Tree: introduction, types, definition, properties, representations, operations, binary tree traversal, Header nodes; Threads, BST, Advanced trees: AVL trees or height balanced trees, representation operation, Expression trees. Multiway trees: trees, multiway search trees, B trees, Heaps, construction of a Heap.	[6]
UNIT-6 Graph: Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, linked representation. Operations, Traversing, Posets, Topological sorting.	[6]

Text Books:

1. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised Edition.
2. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
3. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition,1983.

Reference Books:

1. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1st Edition, 1999
2. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4thEdition, 2013.
3. Y. Langsm, M. Augenstin, A. Tanenbaum, Data Structure using C and C++, Prentice Hall India Learning Private Limited, 2nd Edition, 1998.
4. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2nd Revised Edition, 1983.

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Analog Electronics Laboratory

23EC2304	PCC	Analog Electronics laboratory	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	CA-I:15 Marks CA-II: 15 Marks End Semester Exam-20 Marks

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

CO1	Build and analyze common source amplifier circuits
CO2	Make use of FET for oscillator circuits.
CO3	Design and analysis of series and shunt voltage regulator circuits.
CO4	Demonstrate the use of timer IC for various applications

List of Experiments:

Sr.No.	**Name of the Experiments**
1.	Design a single stage self-biased FET CS Amplifier and verify its DC operating point
2.	Build and test the performance of single stage CS amplifier using FET.
3.	Simulate frequency response of single stage common source amplifier and find bandwidth.
4.	Simulate Voltage series feedback amplifier.
5.	Design Zener shunt regulator circuit and measure load and line regulation.
6.	Design and implement an adjustable voltage regulator using fixed voltage regulators.
7.	Design and implement an adjustable voltage regulator using LM317
8.	Implement LC oscillator using FET
9.	Implement RC oscillator using FET
10.	Simulate MOSFET Inverter.
11.	Design and study the monostable multivibrator circuit using 555 timer.
12.	Design and study the astable multivibrator circuit using 555 timer.

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Data structure Laboratory

23EC2305	PCC	Data structure Laboratory	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/Week	CA-I :15 Marks CA-II :15 Marks End Semester Exam: 20 Marks

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

CO1	Develop logic for insertion, deletion & display
CO2	Make use of an array for searching & sorting.
CO3	Construct linked list, stack & queue.

List of Experiments:

Sr. No	Name of the Experiments
1.	Program to insert an element into an array.
2.	Program to delete an element from an array.
3.	Program to sort the array using bubble sorting.
4.	Program to search a number in an array using linear search.
5.	Program to search a number in an array using binary search.
6.	Program to perform operations on 2-D array.
7.	Program to insert node into linked list.
8.	Program to delete the node from linked list.
9.	Program to perform PUSH & POP operation on the stack.
10.	Program to perform queue operation.

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Simulation Laboratory

23EC2306	PCC	Simulation Laboratory	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/Week	CA-I :15 Marks CA-II :15 Marks End Semester Exam: 20 Marks

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

CO1	Demonstrate Half, Full Adder and Half Subtractor Circuit using ORCAD PSpice.
CO2	Experiment with Half & Full wave Rectifier using Multisim.
CO3	Make use of Simulink for two Signal Addition & Multiplication.
CO4	Develop Series & Parallel Circuit using Proteus.

List of Experiments:

Sr. No	Name of the Experiments
1.	Study Simulation using ORCAD PSpice.
2.	Design the circuit of half adder. Using ORCAD PSpice.
3.	Design the circuit of Half Subtractor using ORCAD PSpice.
4.	Study Introduction to Multisim.
5.	Implement Half Wave Rectifier using Multisim .
6.	Implement Full Wave Rectifier using Multisim.
7.	Perform Experiment on two Signal Addition using Simulink .
8.	Perform Experiment on two Signal Multiplication using Simulink .
9.	Study Introduction to proteus.
10.	Design and test SERIES CIRCUIT using proteus.
11.	Design and test parallel CIRCUIT using proteus .

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Employability and skill Development

23EC2307	EEM	Employability and skill Development	2-0-0	2 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA-I: 25 Marks CA-II: 25 Marks Mid Semester Exam: NA End Semester Exam: NA

Pre-Requisites: Basic Electronics

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

CO1	Define skills and preparedness for aptitude tests.
CO2	Develop the ability to think critically and logically.
CO3	Make use of presentation skill and be ready for facing interviews.
CO4	Apply grammar rules accurately in both written and spoken communication.
CO5	Utilize a sense of civic responsibility and the importance of financial planning.
CO6	Build team and lead it for problem solving.

Course Contents:

Unit 1: Soft Skills & Communication basics Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills. Resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing.	[4]
Unit 2: Analytical Reasoning and Quantitative Ability Matching, Selection, Arrangement, Verification (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy).	[4]
Unit 3: Skills for interviews Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, difference between group discussion, panel discussion and debate, Listening skills- virtues of listening, fundamentals of good	[4]

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listening,Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.	
Unit 4: Grammar and Comprehension English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, Paraphrasing and e-mail writing.	[4]
Unit 5: Constitutional values, Financial and Legal Literacy Constitutional values - Citizenship, Becoming a Professional in the 21st Century Duration, Diversity & Inclusion Significance of using financial products and services safely and securely, importance of managing expenses, income, and savings. significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws.	[4]
Unit 6: Problem Solving Techniques Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the actions. Problem solving skills: 1. Communicate. 2. Brain storming, 3. Learn from mistakes	[4]
Text Books: 1. R. Gajendra Singh Chauhan, Sangeeta Sharma, "Soft Skills- An integrated approach to maximize personality", ISBN: 987-81-265-5639-7, First Edition 2016, Wiley. 2. Wren and Martin, "English grammar and Composition", S. Chand publications. 3. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.	
Reference Books: 1. Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd. 2. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page 3. Eugene Ehrlich, Daniel Murphy, "Schaum's Outline of English Grammar", McGraw Hills. 4. David F. Beer, David A. McMurrey, "A Guide to Writing as an Engineer", ISBN : 978-1-118-30027-5 4th Edition, 2014, Wiley.	

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Environmental Sciences

23EC2308	VEC	Environmental Sciences	2-0-0	2 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA -I: 25 Marks CA -II: 25 Marks

Pre-Requisites: NA

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

CO1	Explain nature of environmental studies.
CO2	Explain various natural resources and associated Problems.
CO3	Summarize various ecosystems.
CO4	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO5	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution.
CO6	Interpret the information based on field study and prepare a report.

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Course Contents:

Unit 1: Nature of Environmental studies Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[4]
Unit 2: Natural Resources and Associated Problems **Forest resources:** Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. **Water resources:** Use and over-utilization of surface and ground water, floods, conflicts over water. **Mineral resources:** Usage and exploitation. Environmental effects of extracting and using mineral resources. **Energy resources:** Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, nuclear energy. **Land resources:** land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources.	[4]
Unit 3: Ecosystems Concept of an ecosystem, types of ecosystems, structure and function of an ecosystem, producers, consumer and decomposers. Energy flow in the ecosystem, food chain, food web and ecological pyramids, ecological succession. Different types of ecosystems are a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystem	[4]
Unit 4: Biodiversity Introduction-Definition: genetic, species and ecosystem diversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Western Ghats as a biodiversity region Hot spot of biodiversity. Threats to biodiversity, man and wildlife conflicts. Conservation of biodiversity. In-situ conservation and Ex-situ conservation.	[4]
Unit 5: Environmental Pollution and Environmental Protection Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development. Environmental Protection Act. Air (Prevention and Control of pollution) Act. Water (Prevention and Control of pollution) Act. Forest conservation Act. Wildlife Protection Act. Human Rights.	[4]

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Unit 6: Field work Visit to a local area to document Environmental assets-River, Forest, Grassland, Visit to local polluted site, Study of common plants, insects, birds,Study of ecosystem river, ponds etc.	[4]
Text Books: 1. P. N. Wartikar & amp; J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.	
Reference Books: 1.C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd. 2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi. 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. 5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd. Singapore	

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Mini Project-II

23EC2309	CEP	Mini Project-II	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Lecture: --NA Tutorial: -- NA Practical:2hrs/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: None.

About Ideathon

The project is a part of addressing societal and industrial needs. An ideathon is a brief, intense event where students can work on some of the most important problems that the world is facing today. Ideations are brainstorming events where people with diverse knowledge backgrounds, skill sets and interests get together to predetermined problems, and come up with substantive, innovative and comprehensive solutions. An ideathon's output might be ideas, a roadmap or an actionable plan. Teams leverage design thinking and cutting-edge techniques to brainstorm and collaborate on potential solutions within a given time frame.

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

CO1	Identify problems based on societal /research needs
CO2	Apply Knowledge and interpersonal skills to solve societal problems in a group.
CO3	Draw the proper inferences from available results through theoretical/ experimental/simulations.
CO4	Analyse the impact of solutions in societal and environmental context for sustainable development.
CO5	Demonstrate capabilities of self-learning in a group, which leads to lifelong learning.
CO6	Demonstrate project management principles during project work.

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Course Contents:

Week 1: Higher Education and Case Study Pedagogy • Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity. • Allocation of mentor	[2]
Week 2: Topic Selection • Briefly interact with students to provide hand-holding for topic selection. • Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor • **Illustrative Examples : Any Industry or Societal Problem** • Finalization of Title.	[2]
Week 3: Case Study Design/Ideathon: Part 1 • If needed, provide hand-holding to students for finalizing objectives. • Review the objectives of the case study groups. • Identify what can be quantified related to your topic and how. • Decide objectives for your case study. • Continue reading especially recent work specific to your topic.	[2]
Week 4: Case Study Design/Ideathon: Part 2 • Prepare a roadmap of your case study, identify what is to be measured on the field. • Ensure student groups have finalized the objectives.	[2]
Week 5: Survey Design • Prepare a questionnaire and try it out with your group members as mock. • Decide sampling strategy.	[2]
Week 6: Analysis Phase-1 • Students in a group shall understand problem effectively, propose multiple solution. • The students have to work on different approaches and search for the different methodology to solve the problem in consultation with the project guide.	[2]
Week 7 Analysis Phase-2 • The students have to finalize the best methodology to solve the problem in consultation with the project guide. • 25% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 8: Analysis-3 • Identify appropriate data visualization tools for your case study. • Analyze the data	[2]
Week 9: Analysis-4 • Identify appropriate data visualization tools for your case study. • Analyze the data	[2]
Week 10: Report writing Part:1 • Prepare an outline of the report and start organizing the write-up for the first draft. • Prepare and submit the first draft of the report to the course coordinator.	[2]

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Week 11: Report writing Part:2 • Make necessary corrections if any as per the suggestions of course coordinator. • Submit the final draft of the case study	[2]
Week 12: Final Presentation • 50% Presentation has to be conducted by mentor/guide based on above activity.	[2]

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Electrical & Electronics Measurement

23ECMDA1	MDM	Electrical & Electronics Measurement	2-0-0	2 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Mathematics General Mathematics Class XII Physics Electricity Class XII.

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

CO1	Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments.
CO2	Examine various real-life situations in domestic or industrial scenario where measurements of electrical quantities are essential.
CO3	Choose the proper type and specification of measuring procedure and measuring instruments for different industrial/commercial/domestic plications.
CO4	Identify the fault conditions in electrical installations with identify necessary remedial measures.
CO5	Make use of different electronics instruments.
CO6	Classify the different sensors and transducers with their applications.

Course Contents:

Unit 1: Measurement Basic Electrical Measurements: Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.	[6]
Unit 2: Analog meters General features, Construction, Principle of operation and torque equation of Moving coil, Moving Iron, Electrodynamometer, Induction instruments. Principle of operation of the Electrostatic,Thermoelectric, Rectifier type instruments, Extension of instrument ranges and Multipliers.	[6]

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Unit 3: Instrument transformer Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors. Measurement of Power: Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.	[6]
Unit 4: AC Bridges Measurement of Energy: Construction, theory and application of AC energy meter, testing of energy meters. Potentiometer: Principle of operation and application of Crompton's DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application. Measurement of Inductance, Capacitance and frequency by AC bridges.	[6]
Unit 5: Electronic Instruments CRO: - Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO. Electronic Instruments: Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter.	[6]
Unit 6: Introduction to Sensors &Transducers Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.	[6]
Text Books: 1.A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai &sons. 2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing. 3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.	
Reference Books: 1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition. 2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill. 3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper,Wheeler Publication. 4. Instrument transducers, H.K.P. Neubert, Oxford University press	

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Python Programming for Data Science

23ECMDB1	MDM	Python Programming for Data Science	2-0-0	2-Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basics of programming language & Statistics for Data Science

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

CO1	Understand basics of Python Programming
CO2	Describe Python function, Modules & Packages
CO3	Describe different lists, tuple and dictionary
CO4	Examine concept of Input-output and exception handling.
CO5	Identify and describe the methods and techniques commonly used in Data Science.
CO6	Implement NumPy and Pandas.

Course Contents:

Unit 1: Introduction to Python programming History, Features, setting up path, Working with Python, Syntax, Variables and data types, operator. Conditional statements: If, If-else, Nested If-else. Looping: For, While, Nested loops. Control statements: Break, continue, pass and string manipulation.	[6]
Unit 2: Python function, Modules & Packages Modules and functions, Function definition and use, flow of execution, parameters and arguments, Standard packages: Mathematics, Internet Access, Dates and Times, Data Compression, Multi-threading.	[6]
Unit 3: Python List, Tuple & Dictionary	[6]

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List: Accessing list, List operations, Working with Lists, Functions and Methods. Tuple: Accessing Tuples, operations, Working with Lists, Functions and Methods. Dictionary: Accessing values in Dictionaries, Working with Dictionaries, Properties and Functions.	
Unit 4: Input-Output Printing on screen, reading data from keyboard, opening and closing file, reading and writing files, functions, exception handling, except clause, Try, finally clause, User defined Exceptions.	[6]
Unit 5: Introduction to data science Data Science and Its Scope: What Is Data Science, Data Science and Statistics, Role of Statistics in Data Science, A Brief History, Difference between Data Science and Data Analytics, Knowledge and Skills for Data Science Professionals, Some Technologies used in Data Science, Benefits and uses of data science, Facets of data, data science project lifecycle.	[6]
Unit 6: NumPy and Pandas Introduction Pandas, Installing Pandas, Features of Pandas, NumPy Arrays, NumPy Data Types, Ways to create NumPy Arrays, Difference between Pandas and NumPy.	[6]
Text Books: 1. "Introducing Data Science", DAVY CIELEN, ARNO D. B. MEYSMAN, MOHAMEDALI, Manning Publications. 2. "Python Data Science Handbook: Essential Tools for Working with Data", Jake VanderPlas, O'REILLY Publication.	
Reference Books: 1. Data Science from Scratch: First Principles with Python By O"Reilly Media, 2015. 2.Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining by Glenn J. Myatt John Wiley Publishers, 2000	

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Electrical Machines and Instruments

23ECMDC1	MDM	Electrical Machines and Instruments	2-0-0	2-Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 2 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Mathematics General Mathematics Class XII Physics Electricity Class XII.

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

CO1	Interpret theoretical knowledge with mathematical principles of DC machines.
CO2	Experiment with various real-life situations in domestic or industrial of induction and synchronous motors.
CO3	Utilize proper types and specifications of measuring procedure and measuring instruments for different industrial/commercial/domestic applications.
CO4	Develop the knowledge of theoretical and mathematical principles of sensors and Different types of transducers.
CO5	Discover new sensing and measuring schemes for various electrical and electronic applications.
CO6	Evaluate sensing and measuring schemes for various I/O devices.

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Course Contents:

Unit 1: DC Machine DC machines construction, working principle, Types and its characteristics of DC machines (motor and generator), starters of DC machines, speed control of DC machine, Braking of DC machine, applications of DC machines	[6]
Unit 2: Induction motor and Synchronous motor **Induction Motor**- Construction, working principle and types. Speed control of 3 phase induction motor, braking of induction motors, applications. **Synchronous motor** – construction, working principle, starting methods, applications.	[6]
Unit 3: Special Purpose Machines Construction, working and application of stepper motor, servo motor, linear IM, Variable reluctance motor. repulsion motor.	[6]
Unit 4: Sensors and Transducers Classification selection of Transducers, Pressure Transducers, LVDT, Temperature Transducers, piezoelectric transducers, photosensitive Transducers, Proximity sensors.	[6]
Unit 5: Electronic Instruments CRO: - Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO. Electronic Instruments: Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter.	[6]
Unit 6: I/O Devices Recorder X-Y plotters and its applications optical oscillograph.	[6]
Text Books: 1.A course in Electrical & Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai &sons. 2. Electrical Measurement & Measuring Instruments, E.W. Golding & F.C. Wides, Wheeler Publishing. 3. Electronic Instruments, H.S. Kalsi, Tata Mc-Graw hill, 2nd Edition.	
Reference Books: 1. Sensors & Transducers, D. Patranabis, PHI, 2nd edition. 2. Digital Instrumentation, A.J. Bouwens, Tata Mc-Graw hill. 3. Modern Electronic instrumentation & Measuring instruments, A.D. Heltric & W.C. Copper,Wheeler Publication. 4. Instrument transducers, H.K.P. Neubert, Oxford University press	

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Aptitude Skills-I
(Numerical Ability)

23HSSM01	VEC	Aptitude Skills-I	1-0-0	1 Credit

Teaching Scheme:	**Examination Scheme:**
Lecture: 1 hrs/week Tutorial: NA Practical: NA	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: English Communication

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

CO1	Make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems
CO2	Solve questions based on Number system
CO3	Solve questions based on percentage, average, ratio, proportion, Speed, Time and Distance
CO4	Solve questions based on Profit & Loss and mensurations.

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots.	[3]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions.	[3]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership. **Speed- Time- Distance** Speed, Time, and Distance, Trains, Boats, Streams, Races.	[3]
Unit 4: Business Aptitude Profit & Loss, Simple Interest, Compound Interest **Geometry and Venn Diagram** 2D and 3D Mensuration, Venn diagram.	[3]

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Text Books:

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition.

Reference Books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar

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Language Skills- I

23HSSM02	VEC	Language Skills- I	0-0-2	Audit

Teaching Scheme:	**Examination Scheme:**
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Basics of Programming.

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

CO1	Develop flowchart and Algorithm to solve the given problem statements.
CO2	Develops programs using Data Types and Operators.
CO3	Make use of Decision Making and Looping Statements to develop conditional programs.
CO4	Make use of Arrays to develop programs in C language.

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Course Contents:

Expt.No.	Name of Experiments.
01	Explain basics of C such as Editing, Compiling, Error Checking, executing, testing and debugging of Programs and Deign Algorithms and Flowcharts.
02	Explain basics of Variable, Data types and operators and develop programs on arithmetic Operators.
03	Develop programs on Conditional, logical and Bitwise Operators.
04	Develop programs on Sizeof () and typecasting operator.
05	Develop programs on increment and decrement operator.
06	Develop programs on simple if and if-else statement.
07	Develop programs on simple if-else ladder and Nested if-else.
08	Develop programs on Switch case statement.
09	Develop programs on For-loop & Nested For-loop.
10	Develop programs on while and do-while loop.
11	Develop programs on one dimensional array.
12	Develop programs on two-dimensional array.
13	Develop programs on string handling functions.

Text Books:

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference Books:

1. Programming in C Practical Approach by Ajay Mittal, Pearson
2. Let Us C, By Yashwat Kanetkar

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