Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Basic Electronics
Course Code	ECL0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of modern physics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To become familiar with various types of semiconductors and basic electronic devices.**(BL1-Remember)** **CO2-** To understand the operation of various electronic devices.**(BL2-Understand)** **CO3-** To implement the concepts of semiconductors to various semiconductor devices.**(BL3-Apply)** **CO4-** To analyze the various electronic devices and their frequency response.**(BL4-Analyze)** **CO5-** To evaluate the performance of electronic devices such as diodes, transistors, function generators, and cathode ray oscilloscopes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Semiconductor Basics: Intrinsic and Extrinsic Semiconductors, Current Mechanisms in Semiconductors: Drift and Diffusion Current. PN Junction: Formation of PN Junction, Creation of Depletion Layer, Forward and Reverse Biasing, Diode Current Equation, Volt – Ampere characteristics of PN junction diode and effect of temperature on V-I characteristics, Diode resistances, Diode Capacitances, Diode Equivalent circuits: Piecewise Linear approximation Model, Simplified approximation Model, Ideal equivalent circuit.	Whiteboard/PPT/Video	12
II	Diode Applications: Diode as Rectifier: Half Wave rectifier, Full Wave Rectifier, Calculation of Average, RMS loads voltages and currents, Rectification efficiency, PIV, Ripple factor. Break Down Diodes: Avalanche and Zener Breakdown. V-I characteristics of Zener Diode, Zener Diode Specifications, Zener Diode Equivalent Circuit. Zener Diode as Shunt Regulator: Analysis of Zener diode as shunt regulator under varying Load capacitance and Supply voltage.	PPTs/White Board	10
III	Bipolar Junction Transistor: Formation of NPN and PNP Transistor, unbiased and biased transistor, Transistor currents, Symbol of NPN and PNP Transistors, Common Base, Common Emitter and Common Collector Configurations along with Input and Output Characteristics, Transistor Amplifying action. Transistor Biasing: Load Line, Operating Point, Need of Biasing, Different Biasing Techniques: Fixed Bias, Emitter Stabilized Bias, Voltage Divider Bias, DC Bias with Voltage Feedback	PPTs/White Board/video	10
IV	Field Effect Transistor: JFET: Construction of N channel and P channel JFET, Working of JFET along with Drain and Transfer Curves, JFET Parameters and symbol, JFET Biasing. MOSFET: Construction and working of N channel and P channel Depletion and Enhancement MOSFETs, Drain and Transfer curves, Symbols. Operational Amplifier: Basics of operation amplifier, op-amp parameters: Input offset voltage, Output offset voltage, Slew rate, CMRR etc. Open and closed loop gain, Virtual Ground, Characteristic of ideal operational amplifier. Operational Amplifier Applications: Use of Ideal Op-amp to construct: Inverting amplifier, Non-inverting amplifier, Differentiator, Integrator, Adder, Subtractor etc.	Whiteboard/PPT	12
V	Electronic Instruments: Digital Voltmeter, Digital Multimeter, Cathode Ray Oscilloscope, Applications of CRO: Measurement of Voltage, Current, Time	PPT/White board	10

	Period, Frequency, Use of Lissajous Pattern to Measure unknown frequency and phase difference, Function Generator.		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to Laboratory Equipment's: Cathode Ray Oscilloscope (CRO), Function Generator, Digital Multimeter.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Boylestad & Nashelsky Electronics Devices and Circuit Theory Pearson Education India, 2009. Ramakant A. Gayakwad Op Amps and Linear Integrated Circuits Englewood Cliffs: Prentice-Hall, 2012.
Articles	
References Books	Malvino, L. Electronic principles The McGraw Hill Companies, 2016. Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press 2017 Graham Bell Electronic Devices and Circuits Prentice-Hall 2009
MOOC Courses	https://nptel.ac.in/courses/122106025
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	-	-	-	1	1	-	2	2	1
CO2	1	2	1	1	1	1	-	-	-	1	-	-	2	2	2
CO3	1	1	1	1	-	-	-	-	-	-	1	-	2	3	2
CO4	1	1	1	1	1	-	-	-	-	-	1	-	3	3	2
CO5	1	1	-	1	-	-	-	-	-	1	1	-	2	3	2
CO6	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Basic Electronics
Course Code	ECL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of modern physics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To become familiar with various types of semiconductors and basic electronic devices.**(BL1-Remember)** **CO2-** To understand the operation of various electronic devices.**(BL2-Understand)** **CO3-** To implement the concepts of semiconductors to various semiconductor devices. **(BL3-Apply)** **CO4-** To analyze the various electronic devices and their frequency response.**(BL4-Analyze)** **CO5-** To evaluate the performance of electronic devices such as diodes, transistors, function generators, and cathode ray oscilloscopes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Semiconductor Basics: Intrinsic and Extrinsic Semiconductors, Current Mechanisms in Semiconductors: Drift and Diffusion Current. PN Junction: Formation of PN Junction, Creation of Depletion Layer, Forward and Reverse Biasing, Diode Current Equation, Volt – Ampere characteristics of PN junction diode and effect of temperature on V-I characteristics, Diode resistances, Diode Capacitances, Diode Equivalent circuits: Piecewise Linear approximation Model, Simplified approximation Model, Ideal equivalent circuit.	Whiteboard/PPT/Video	12
II	Diode Applications: Diode as Rectifier: Half Wave rectifier, Full Wave Rectifier, Calculation of Average, RMS loads voltages and currents, Rectification efficiency, PIV, Ripple factor. Break Down Diodes: Avalanche and Zener Breakdown. V-I characteristics of Zener Diode, Zener Diode Specifications, Zener Diode Equivalent Circuit. Zener Diode as Shunt Regulator: Analysis of Zener diode as shunt regulator under varying Load capacitance and Supply voltage.	PPTs/White Board	10
III	Bipolar Junction Transistor: Formation of NPN and PNP Transistor, unbiased and biased transistor, Transistor currents, Symbol of NPN and PNP Transistors, Common Base, Common Emitter and Common Collector Configurations along with Input and Output Characteristics, Transistor Amplifying action. Transistor Biasing: Load Line, Operating Point, Need of Biasing, Different Biasing Techniques: Fixed Bias, Emitter Stabilized Bias, Voltage Divider Bias, DC Bias with Voltage Feedback	PPTs/White Board/video	10
IV	Field Effect Transistor: JFET: Construction of N channel and P channel JFET, Working of JFET along with Drain and Transfer Curves, JFET Parameters and symbol, JFET Biasing. MOSFET: Construction and working of N channel and P channel Depletion and Enhancement MOSFETs, Drain and Transfer curves, Symbols. Operational Amplifier: Basics of operation amplifier, op-amp parameters: Input offset voltage, Output offset voltage, Slew rate, CMRR etc. Open and closed loop gain, Virtual Ground, Characteristic of ideal operational amplifier. Operational Amplifier Applications: Use of Ideal Op-amp to construct: Inverting amplifier, Non-inverting amplifier, Differentiator, Integrator, Adder, Subtractor etc.	Whiteboard/PPT	12
V	Electronic Instruments: Digital Voltmeter, Digital Multimeter, Cathode Ray Oscilloscope, Applications of CRO: Measurement of Voltage, Current, Time	PPT/White board	10

	Period, Frequency, Use of Lissajous Pattern to Measure unknown frequency and phase difference, Function Generator.		

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to Laboratory Equipment's: Cathode Ray Oscilloscope (CRO), Function Generator, Digital Multimeter.	Experiments	BL2-Understand	2
5	Measurement of Amplitude, Time Period & Frequency of a Signal using CRO.	Experiments	BL4-Analyze	2
2	To study and plot the V-I characteristics of PN Junction Diode.	Experiments	BL4-Analyze	2
3	To study Full Wave Centre Tap Rectifier and calculate various parameters.	Experiments	BL4-Analyze	2
1	To study and plot the V-I characteristics of PN Junction Diode.	Experiments	BL4-Analyze	2
4	To study Full Wave Bridge Rectifier and calculate various parameters	Experiments	BL4-Analyze	2
3	To study and plot Input & Output Characteristics of BJT in Common Base Configuration	Experiments	BL5-Evaluate	2
4	To study and plot Input & Output Characteristics of BJT in Common Emitter Configuration	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	100	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Boylestad & Nashelsky Electronics Devices and Circuit Theory Pearson Education India, 2009. Ramakant A. Gayakwad Op Amps and Linear Integrated Circuits Englewood Cliffs: Prentice-Hall, 2012.
Articles	
References Books	Malvino, L. Electronic principles The McGraw Hill Companies, 2016. Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press 2017 Graham Bell Electronic Devices and Circuits Prentice-Hall 2009
MOOC Courses	https://nptel.ac.in/courses/122106025
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	-	-	1	1	-	-	-	-	1
CO2	1	1	1	1	1	1	-	-	1	1	-	-	2	2	2
CO3	1	1	1	1	1	-	-	-	-	1	-	-	2	3	2
CO4	1	1	1	1	1	-	-	-	1	1	-	-	3	3	2
CO5	1	1	1	1	1	-	-	-	1	1	-	-	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Introduction of Electric Vehicle Technology
Course Code	EEL0132

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Identify EV concepts and parameters for better understanding of the EV technology **(BL1-Remember)** **CO2-** Analyze the EV Propulsion system for vehicular applications for their control.**(BL2-Understand)** **CO3-** Identify different energy sources used in EV.**(BL3-Apply)** **CO4-** Identify concepts of renewable energy sources**(BL4-Analyze)** **CO5-** Identify various alternative energy sources of energy.**(BL2-Understand)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to transportation, Emissions from Vehicle, Evolution of e- mobility, EV Ecosystem and e-mobility in India, current demand in EV industry and opportunities of skilled EV engineers Past, Present & Future of EV, Current Major Issues, Recent Development Trends,	talks and presentations	8
II	Basic concepts related to EV, Types of Electric Vehicles in use today – Battery Electric Vehicle, Hybrid (ICE & others), Fuel Cell EV, Solar Powered Vehicles. Social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.	talks and presentations	9
III	Conventional and Non-conventional sources of energy Conventional energy sources. Non-conventional energy sources. Need of non-conventional energy sources. Renewable Sources of Energy such as Hydro, Solar, Wind, Biomass, Tidal and Geothermal - their availability and limitations.	talks and presentations, quiz	10
IV	Solar constants, Measurement of solar radiations, Solar Energy Conversion CSP generators, construction and working principle construction of a solar PV Systems: Solar cell, Module, Panel and array Types of solar PV system i. Stand –Alone Solar PV system ii. Grid-Interactive solar PV system iii. Hybrid Solar PV system Grid connection issues of solar power plants	talks and presentations, field visits	10
V	Indian & Global Scenarios in Electric Vehicles Technology Scenario, Market Scenario, Policies & Regulations, Payback & Commercial Model, Policies in India	talks and presentations	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
II	Study of electric vehicle system	Experiments	BL2-Understand	2
II	Study of hybrid electric vehicle system.	Experiments	BL4-Analyze	2
IV	Solar based EV Charging station.	Experiments	BL5-Evaluate	2
III	Electric Rickshaw Motor kit	Experiments	BL3-Apply	2
IV	Demonstration of battery management System	Experiments	BL4-Analyze	2
III	Demonstration of Brushless DC motor-based EV	Experiments	BL3-Apply	2
IV	To study about solar photo-voltaic system	Experiments	BL2-Understand	2
III	To study about solar lightning	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Ali Emadi, “Advanced Electric Drive Vehicles”, CRC Press 2.Iqbal Husain, “Electric and Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press.
Articles	E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, “Energy storage devices for future hybrid electric vehicles,” J. Power Sources, vol. 168, no. 1, pp. 2–11, 200
References Books	1.Alfred Rufer, “Energy Storage systems and components”, CRC Press
MOOC Courses	1.https://nptel.ac.in/courses/108106170 Institute Logo NOC:Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan 2.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi
Videos	1.https://www.youtube.com/watch?v=CWulQ1ZSE3c 2.https://www.youtube.com/watch?v=UgtjRob5qMg&list=PLyqSpQzTE6M9spod-UH7Q69wQ3uRm5thr

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	1	-	-	1	-	1	-	-
CO2	-	1	-	1	-	1	1	-	2	-	-	-	-	-	1
CO3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	1	-	-	-	-	2	-	-	-	-	-	-	1	-
CO5	2	-	1	-	-	-	-	-	1	1	-	-	-	-	-
CO6	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical workshop practice
Course Code	EEP0101

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study and performance of different types of WIRE JOINTS	Experiments	BL3-Apply	2
2	Study and performance of GODOWN WIRING	Experiments	BL3-Apply	2
3	Study and performance of STAIRCASE WIRING	Experiments	BL3-Apply	2
4	Series and Parallel connection of Bulbs and Power sockets by single switch and multi switches	Experiments	BL4-Analyze	2
5	Assembling and soldering of 9V DC electronic DISCO LIGHT circuit with demonstration	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	1	-	-	1	-	-	-	1	-	-	-	-	-	1
CO3	-	-	21	-	-	-	-	-	-	2	-	2	-	-	-
CO4	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Communication Skills & Colloquim
Course Code	HUL0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Humanities, Social Sciences and Management							
Pre-Requisite/s	Student must have knowledge about Language proficiency.			**Co-Requisite/s**	Developed Communication skill.			
Course Outcomes & Bloom's Level	**CO1-** Determine interpersonal skills and be an effective goal-oriented team player.**(BL1-Remember)** **CO2-** Classify and formulate the elementary intricacies of Scientific and Technical Writing using applicative grammar construct.**(BL2-Understand)** **CO3-** Examine attitudes, emotional intelligence and understand its influence on behavior. **(BL3-Apply)** **CO4-** Justify approaches to conflict resolution**(BL4-Analyze)** **CO5-** Evaluate Formal Communication.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module 1	Introduction to Communication Skills, Objectives, Significance of Communication, Flow of Communication, Principles Communication, Essential Features, Process of Communication, Verbal (Oral & Written) and Non-verbal Communication, Barriers to Effective Communication, Introduction to Technical Communication, Major Difference between Technical Communication and General Communication.	Classroom Lecture, PPts,	6
Module 2	Introduction & Significance of Listening skills, Types of Listening, Barriers in Effective Listening, Basic Grammar - Parts of Speech, Active Passive and Articles.	Classroom Lecture, PPts,	6
Module 3	Introduction to Formal Letter Writing, Elements of Letter Writing and Style of Writing, Layout & Structure of Formal Letter Writing, Introduction to the Types of Business Letters- Enquiry, Calling Quotations, Order,Complaint and Adiustment.Introduction to Employment Communication- Job Application, Writing Resume, Differences among Resume, Curriculum Vitae & Bio-data.	Classroom Lecture, PPts, Videoes	6
Module 4	Introduction to Oral Presentations, Objectives, Significance and Approach, Preparation and Delivery of Oral Presentation (topics to be selected by the teachers). Introduction to Interview Skills. How to Develop Interview Skills. Dos and Don't of Interviews, Types of Interviews, Reviewing TV Program/Book/News Paper Articles etc	Classroom Lecture, PPts, Videos	6
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports- Printed Format, Memo Format, Letter Format, Book/Letter Text Format. Layout and Structure of Reports, Components of Reports, Writing.	Classroom Lecture, PPts, Videos	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi
Articles	https://www.jetir.org/papers/JETIR2108373.pdf https://open.lib.umn.edu/communication/chapter/1-2-the-communication-process/ https://www.iosrjournals.org/iosr-jbm/papers/Vol22-issue8/Series-2/E2208024254.pdf
References Books	Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Communication Skills & Colloquim
Course Code	HUL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Humanities, Social Sciences and Management							
Pre-Requisite/s	The students have a basic knowledge and understanding of the English language and communication.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Comprehend and summarize characteristics & various structural principles prerequisite to Technical Communication**()** **CO2-** Classify and formulate the elementary intricacies of Scientific and Technical Writing using applicative grammar construct.**(BL3-Apply)** **CO3-** Create cohesive technical paragraphs & text**(BL3-Apply)** **CO4-** Paraphrase text(s) and use appropriate referencing styles**(BL3-Apply)** **CO5-** Design and present/publish technical documents**()**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG4(Quality education) SDG5(Gender equality) SDG10(Reduced inequalities)				

Part B

Modules	Contents	Pedagogy	Hours
M	Introduction to Communication Skills, Objectives, Significance of Communication, Flow of Communication, Principles Communication, Essential Features, Process of Communication, Verbal (Oral & Written) and Non-verbal Communication, Barriers to Effective Communication, Introduction to Technical Communication, Major Difference between Technical Communication and General Communication.	Classroom Lecture, PPts,	6
Module 2	Introduction & Significance of Listening skills, Types of Listening, Barriers in Effective Listening, Basic Grammar - Parts of Speech, Active Passive and Articles.	Classroom Lecture, PPts,	6
Module 3	Introduction to Formal Letter Writing, Elements of Letter Writing and Style of Writing, Layout & Structure of Formal Letter Writing, Introduction to the Types of Business Letters- Enquiry, Calling Quotations, Order,Complaint and Adiustment.Introduction to Employment Communication- Job Application, Writing Resume, Differences among Resume, Curriculum Vitae & Bio-data.	Classroom Lecture, PPts, Videoes	6
Module 4	Introduction to Oral Presentations, Objectives, Significance and Approach, Preparation and Delivery of Oral Presentation (topics to be selected by the teachers). Introduction to Interview Skills. How to Develop Interview Skills. Dos and Don't of Interviews, Types of Interviews, Reviewing TV Program/Book/News Paper Articles etc.	Classroom Lecture, PPts, Videos	6
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports- Printed Format, Memo Format, Letter Format, Book/Letter Text Format. Layout and Structure of Reports, Components of Reports, Writing.	Classroom Lecture, PPts, Videos	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to MATLAB through matrices, and general Syntaxes.	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Mishra. B, Sharma. S Communication Skills for Engineers and Scientists
Articles	Rizvi, M.A. Academic Writing: A course in English for Science and Technology, Nabodaya Prakashak , Calcutta
References Books	Pal, Rajendra and Korlahalli, J.S. Essentials of Business Communication
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_hs76/preview
Videos	Markel, Michael, Technical Writing: Situations and Strategies: St. Martin's Press

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Calculus For Engineers
Course Code	MAL0101[P]

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">1st</td><td rowspan="2">Semester</td><td rowspan="2">1st</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>10</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Basic knowledge of Functions, Limit, Continuity and Differentiability</td><td>Co-Requisite/s</td><td colspan="4">Basic knowledge of variables</td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Knowledge about the derivative and use of derivative to expand the functions and evaluation of Maxima and Minima.(BL1-Remember)
CO2- Knowledge about the vector valued function directional derivative, gradient, divergence and curl with their properties(BL2-Understand)
CO3- Applying: Partial derivatives and its applications apply to evaluate the Maxima and Minima.(BL3-Apply)
CO4- Find the area under a given curve, length of an arc through integration as application to Beta and Gamma Function.(BL4-Analyze)
CO5- Evaluating: Find the area and volume by applying the techniques of double and triple integrals., (BL5-Evaluate)
CO6- Applications of vector valued function in integration to find line , surface and volume. (BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Differentiation, Extremaon an Interval, Rolle's Theorem and the Mean Value Theorem, Increasing and Decreasing functions and First derivative test, Second derivative test, Maxima and Minima. Functions of two variables, partial derivatives, total differential, Jacobian and it Prosperities	Audio/Video clips, group discussion, lecture with PPTs, quiz	8
Unit 2	Taylor's expansion for two variables, maxima and minima, constrained maxima and minima, Lagrange's multiplier method. Integration, Average function value, Area between curves, Volumes of solids of revolution, Beta and Gamma functions, interrelation.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 3	Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, Evaluation of triple integrals, change of variables between Cartesian and cylindrical and spherical co-ordinates, evaluation of multiple integrals using gamma and beta functions.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 4	Scalar and vector valued functions, gradient, tangent plane, directional derivative, divergence and curl, scalar and vector potentials, Statement of vector identities, Simple problems.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8
Unit 5	Line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence Theorems, verification and evaluation of vector integrals using them.	Audio/Video clips, group discussion, lecture with PPTs, Quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to MATLAB through matrices, and general Syntaxes.	Experiments	BL3-Apply	2
2	Plotting and visualizing curves and surfaces in MATLAB– Symbolic computations using MATLAB	Experiments	BL3-Apply	2
3	Evaluating Extremum of a single variable function	Experiments	BL3-Apply	2
4	Understanding integration as Area under the curve	Experiments	BL3-Apply	2
5	Evaluation of Volume by Integrals (Solids of Revolution)	Experiments	BL3-Apply	2
6	Evaluating Maxima and minima of functions of several variables	Experiments	BL3-Apply	2
7	Evaluating triple integrals	Experiments	BL3-Apply	2
8	Evaluating gradient, curl and divergence	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	1. Thomas' Calculus by George B. Thomas, D. Weirand J. Hass, 13th edition 2014, Pearson. 2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 3. B.V. Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill.
Articles	
References Books	1. E. Kreyszig, Advanced Engineering Mathematics, 8th Ed., John Wiley and Sons, 1999. 2. Gorakhprasad, Integral Calculus, Pothishala Publication. 3. Gorakhprasad, Differential Calculus, Pothishala Publication.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee09/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ph02/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	1	3
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Calculus For Engineers
Course Code	MAL0101[T]

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">1st</td><td rowspan="2">Semester</td><td rowspan="2">1st</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>10</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Basic knowledge of Functions, Limit, Continuity and Differentiability</td><td>Co-Requisite/s</td><td colspan="4">Basic knowledge of variables</td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Knowledge about the derivative and use of derivative to expand the functions and evaluation of Maxima and Minima.(BL1-Remember)
CO2- Knowledge about the vector valued function directional derivative, gradient, divergence and curl with their properties(BL2-Understand)
CO3- Applying: Partial derivatives and its applications apply to evaluate the Maxima and Minima.(BL3-Apply)
CO4- Find the area under a given curve, length of an arc through integration as application to Beta and Gamma Function.(BL4-Analyze)
CO5- Evaluating: Find the area and volume by applying the techniques of double and triple integrals., (BL5-Evaluate)
CO6- Applications of vector valued function in integration to find line , surface and volume. (BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Differentiation, Extremaon an Interval, Rolle's Theorem and the Mean Value Theorem, Increasing and Decreasing functions and First derivative test, Second derivative test, Maxima and Minima. Functions of two variables, partial derivatives, total differential, Jacobian and it Prosperities	Audio/Video clips, group discussion, lecture Method	8
Unit 2	Taylor's expansion for two variables, maxima and minima, constrained maxima and minima, Lagrange's multiplier method. Integration, Average function value, Area between curves, Volumes of solids of revolution, Beta and Gamma functions, interrelation.	Audio/Video clips, group discussion, lecture Method	8
Unit 3	Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, Evaluation of triple integrals, change of variables between Cartesian and cylindrical and spherical co-ordinates, evaluation of multiple integrals using gamma and beta functions.	Audio/Video clips, group discussion, lecture Method	8
Unit 4	Scalar and vector valued functions, gradient, tangent plane, directional derivative, divergence and curl, scalar and vector potentials, Statement of vector identities, Simple problems.	Audio/Video clips, group discussion, lecture Method	8
Unit 5	Line, surface and volume integrals, Statement of Green's, Stoke's and Gauss divergence Theorems, verification and evaluation of vector integrals using them.	Audio/Video clips, group discussion, lecture Method	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction to MATLAB through matrices, and general Syntaxes.	Experiments	BL3-Apply	2
2	Plotting and visualizing curves and surfaces in MATLAB– Symbolic computations using MATLAB	Experiments	BL3-Apply	2
3	Evaluating Extremum of a single variable function	Experiments	BL3-Apply	2
4	Understanding integration as Area under the curve	Experiments	BL3-Apply	2
5	Evaluation of Volume by Integrals (Solids of Revolution)	Experiments	BL3-Apply	2
6	Evaluating Maxima and minima of functions of several variables	Experiments	BL3-Apply	2
7	Evaluating triple integrals	Experiments	BL3-Apply	2
8	Evaluating gradient, curl and divergence	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	60	30	40	20

Part E

Books	1. Thomas' Calculus by George B. Thomas, D. Weirand J. Hass, 13th edition 2014, Pearson. 2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers. 3. B.V. Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill.
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MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee09/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ph02/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO2	2	3	1	2	2	-	-	-	-	-	-	-	-	2	3
CO3	2	2	1	1	1	-	-	-	-	-	-	-	-	1	3
CO4	1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Engineering Mechanics
Course Code	MEL0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of basic sciences			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1 Remember the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions**(BL1-Remember)** **CO2-** CO2 Understand the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions.**(BL2-Understand)** **CO3-** CO3 Apply system of forces in the belts drive systems as power transmission devices, shafts and beams.**(BL3-Apply)** **CO4-** CO4 Analyze the beams and trusses with centre of mass and moment of inertia.**(BL4-Analyze)** **CO5-** CO5 Evaluate shear force and bending moment in designing of shafts and beams and trusses.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction of Engineering Mechanics Basic concepts of system of forces- Coplanar Concurrent Forces - Components in Space – Resultant Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	9
Unit-2	Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Friction. Motion of Bodies - Wedge, Ladder and Screw jack.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit-3	Transmission of Power Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions- tight side and slack side, Power transmitted and condition for maximum power.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit-4	Center of Gravity & Moment of Inertia: Centroids - Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia..	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts. Trusses- types, method of joints and method of moments.	Lectures with whiteboard/PPT, Quiz, Group discussion	9

<4d style="border: 1px solid black;">Experiments

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	1. To verify the law of Triangle of forces and Lami's theorem.	Experiments	BL3-Apply	2
Experiment-2	2. To verify the law of parallelogram of forces	Experiments	BL3-Apply	2
Experiment-3	3. To verify law of polygon of forces	Experiments	BL3-Apply	2
Experiment-4	4. To find the support reactions of a given truss and verify analytically.	Experiments	BL3-Apply	2
Experiment-5	5. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.	Experiments	BL3-Apply	2
Experiment-6	6. To verify bending moment at a given section of a simply supported beam.	Experiments	BL3-Apply	2
Experiment-7	7. To find coefficient of friction on horizontal and inclined planes.	Experiments	BL3-Apply	2
Experiment-8	8. To determine centre of gravity of different shapes.	BL3-Apply	2	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Engineering Mechanics by Dr. D.S. Kumar, S.K. Kataria & sons, latest edition. Engineering Mechanics by R. K. Rajput, S.Chand & Co. Engineering Mechanics: Statics & Dynamics by R.C. Hibbler
Articles	
References Books	• Engineering Mechanics- statics dynamics by Boresi & Schmidt, Thomson Books • Engineering Mechanics - Schaum's series - Mc.Grawhill Publications. • Engineering Mechanics by S. Timashenko, D.H. Young and J.V. Rao
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106286/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	-	-	1	1	1	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	1	2	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	1	1	1
CO4	3	3	2	3	2	2	1	-	1	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Engineering Mechanics
Course Code	MEL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of basic sciences			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions**(BL1-Remember)** **CO2-** Understand the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions.**(BL2-Understand)** **CO3-** Apply system of forces in the belts drive systems as power transmission devices, shafts and beams.**(BL3-Apply)** **CO4-** Analyze the beams and trusses with centre of mass and moment of inertia.**(BL4-Analyze)** **CO5-** Evaluate shear force and bending moment in designing of shafts and beams and trusses.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction of Engineering Mechanics Basic concepts of system of forces- Coplanar Concurrent Forces - Components in Space – Resultant Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Friction. Motion of Bodies - Wedge, Ladder and Screw jack.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Transmission of Power Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions- tight side and slack side, Power transmitted and condition for maximum power.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Center of Gravity & Moment of Inertia: Centroids - Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia..	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts. Trusses- types, method of joints and method of moments.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	1. To verify the law of Triangle of forces and Lami's theorem.	Experiments	BL3-Apply	2
Experiment-2	2. To verify the law of parallelogram of forces.	Experiments	BL3-Apply	2
Experiment-3	3. To verify law of polygon of forces	Experiments	BL3-Apply	2
Experiment-4	4. To find the support reactions of a given truss and verify analytically.	Experiments	BL4-Analyze	2
Experiment-5	5. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.	Experiments	BL4-Analyze	2
Experiment-6	6. To verify bending moment at a given section of a simply supported beam.	Experiments	BL4-Analyze	2
Experiment-7	7. To find coefficient of friction on horizontal and inclined planes.	Experiments	BL4-Analyze	2
Experiment-8	8. To determine centre of gravity of different shapes	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	Engineering Mechanics by Dr. D.S. Kumar, S.K. Kataria & sons, latest edition. Engineering Mechanics by R. K. Rajput, S.Chand & Co. Engineering Mechanics: Statics & Dynamics by R.C. Hibbler
Articles	
References Books	• Engineering Mechanics- statics dynamics by Boresi & Schmidt, Thomson Books • Engineering Mechanics - Schaum's series - Mc.Grawhill Publications. • Engineering Mechanics by S. Timashenko, D.H. Young and J.V. Rao
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	-	-	1	1	1	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	1	2	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	1	1	1
CO4	3	3	2	3	2	2	1	-	1	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Essentials of Information Technology
Course Code	CSL0201

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Basics of Computer system, Storage Systems, Operating systems, Networking and Database.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)**(BL1-Remember)** **CO2-** Apply the various networking concepts, topologies and remove deadlocks. (Apply). **(BL2-Understand)** **CO3-** Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)**(BL3-Apply)** **CO4-** Design the concept of software, operating system for better utilization of external system (Design)**(BL4-Analyze)** **CO5-** Evaluating the various algorithm, its solution and other communication techniques. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Computer Basics: Basics of Computer Systems(T1,T2), Evolution of Computers, Computer Generations, Classification of Computers(T1,T3), Computer Applications, Interaction between User and Computer(T7). Hardware Components, Basic Computer Organization, Input and Output Devices(T1,T3), Central Processing Unit(T1), System Bus Architecture, Memory or Storage Unit	White Board, PPT	6
2	Operating System: Introduction to Operating System, Function of Operating Systems(T1), Working Knowledge of GUI-Based Operating System (T3,T4), Working with latest version of Windows(T3,T4). Various Operating Systems, Evaluation of Operating System(T3,T4,T,7), Virtual Machine, Operating Systems for Mobile, Installation of Operating System(T1,T3,T4), Boot Process.	White Board, PPT	6
3	Computer Networks and World Wide Web: Introduction to Computer Networks (LAN, MAN, WAN, PAN)(T3,T4), Network Topologies, Ethical Issues related to Network Security(T2,T3). Internet and World Wide Web(T7,T8), Internet Evolution(T1), FTP, Electronic Mail, Search Engines(T1), Introduction to HTML, Static and Dynamic Web Pages	White Board, PPT	6
4	Computer Software: Introduction, System Software(T1,T3), Application Software, Firmware(T3), Software Installing and Uninstalling(T3,T4), Software Development Steps, Characteristics of good software(T1,T7), Usability of software, Introduction to Free and Open Source Software(T3,T4), Introduction to Database Management System	White Board, PPT	6
5	Subprograms and Blocks: Problem Solving: Flow Charts(T3,T4), Tracing Flow Chart, Algorithms. Fundamentals of sub-programs(T1,T3,T4), Scope of life time of variables, static and dynamic scope(T7), design issues of subprograms and operations, parameter passing methods(T3,T4), overloaded sub-programs, generic sub-programs(T1,T3), design issues for functions user defined overloaded operators	White Board, PPT	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Explain the Installation process of Operating system and its Memory Management.	Experiments	BL2-Understand	10
2-3	Design of a Web Page which describe your Biodata.	PBL	BL3-Apply	10
4-5	Describe Software development life cycle (SDLC) with all components.	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	0

Part E

Books	P. K. Sinha, Priti Sinha; Computer Fundamentals; BPB Publication. V. Rajaraman; Fundamentals of Computers; Prentice Hall of India Publication. G. G. Wilkinson; Fundamentals of Information Technology; Wiley-Blackwell Publishing. Yashwant P. Kanetkar; Let Us C; BPB Publication.
Articles	
References Books	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3	-	-	1	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Programming Logics
Course Code	CST0201

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Foundation core							
Pre-Requisite/s	Basic understanding of Windows/Linux operating system.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember: Recall the syntax and basic concepts of C programming.**(BL1-Remember)** **CO2-** Understand: Explain the meaning of C programming constructs and how they work together**(BL2-Understand)** **CO3-** Apply : Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Analyzing: Analyze and evaluate C programming code to identify errors and optimize performance.**(BL4-Analyze)** **CO5-** Evaluate : Evaluate the effectiveness of C programming solutions and propose improvements.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Character set, variables and identifiers, built-in data types, arithmetic operators and expressions, constants and literals, simple assignment statements, basic input/output statements, simple ‘C’ programs.	Demonstration throughPPT, Computer	10
2	Conditional Statements and Loops: Decision making within a program, conditions, relational operators, logical connectives, if statement, if-else statement; Loops: while loop, do-while loop, for loop; nested loops, infinite loops; switch statement, structured programming. Array: One Dimensional Arrays - array manipulation, searching, insertion and deletion in an array; Two Dimensional Arrays - addition/multiplication of two matrices, transpose of a square matrix; string	Demonstration throughPPT, Computer	10
3	Pointer: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, arrays and pointers, pointer arrays, dynamic memory allocation. Functions: Standard library functions, prototype of a function, return type, function calling, block structure, passing arguments to a function - call by reference and call by value; recursive functions, arrays as function arguments.	Demonstration throughPPT, Computer	10
4	Structure and Union: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays - arrays of structure, structures containing arrays, unions. Dynamic Memory Management: Use of malloc, calloc, realloc and free keywords	Demonstration throughPPT, Computer	10
5	File Management: Introduction, defining and opening a file, closing a file, input/output operations on files, error handling during i/o operations, random access to files, programs using files. Command Line Arguments: argv and argc arguments, programs using command line arguments. Preprocessor: Introduction, macro substitution, file inclusion, compiler control directives.	Demonstration throughPPT, Computer	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Life Insurance Premium Calculator	Experiments	BL3-Apply	10
2-3	Program to compare best life insurance plan using an array.	PBL	BL4-Analyze	10
4-5	Write a C program to read name and marks of n number of students from user and store them in a file. If the file previously exits, add the information of n students.	PBL	BL5-Evaluate	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	40				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	0

Part E

Books	B. W. Kernighan, Dennis M. Ritchi; The C Programming Language; Prentice Hall.
Articles	
References Books	Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing.
MOOC Courses	https://www.my-mooc.com/ja/mooc/logic-and-computational-thinking/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	-	2	3	1
CO2	1	2	1	2	2	1	-	-	-	-	-	-	1	-	3
CO3	2	-	1	-	-	2	-	-	-	-	-	-	3	2	2
CO4	2	1	-	2	1	-	-	-	-	-	-	-	3	3	2
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Principles of Electrical Engineering
Course Code	EEL0201

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Predict the behavior of any electrical circuits, Formulate and solve complex DC circuits. **(BL1-Remember)** **CO2-** Predict the behavior of any electrical circuits, Formulate and solve complex single phase AC circuits.**(BL2-Understand)** **CO3-** Predict the behavior of any electrical circuits, Formulate and solve complex Three phase AC circuits.**(BL3-Apply)** **CO4-** Identify the type of electrical machine used for that particular application. Realize the requirement of transformers in transmission and distribution of electric power and other applications.**(BL4-Analyze)** **CO5-** Predict the behavior of various measuring instruments in electrical engineering**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	D.C. Circuit: - Combination of resistance in series & parallel, their solution ,Star –Delta combination, KCL and KVL. Voltage and current sources, dependent and independent sources, source conversion, DC circuit's analysis using mesh & nodal method, Superposition theorem.	Talks and presentations	12
2	Single Phase Circuit:- Generation of Alternating Voltage & Currents, Their Equation, Definition, R.M.S and Average values, Vector representation of alternating quantities, Phasor relations between voltage & current in each of resistance, inductance and capacitance, A.C series circuit power & power factor , Resonance in series circuit.	Talks and presentations	11
3	Electrical Measuring Instruments:- Introduction and classification of Electrical Instruments, Essentials of indicating instruments, Moving iron instruments, Types ofmoving iron instruments, Advantages and Disadvantages of moving iron instruments, Applications of moving iron equipment, Permanente Magnet type moving coil instruments, extension of range of ammeters and voltmeter, Dynamometer type instruments, Dynamometer type wattmeters	Talks and presentations	13
4	Poly-phase Circuits:-Generation of Poly-phase Voltages, 3phase system, Phase sequence, Inter connection of 3 phases, Voltage, Currents & Power relationships in balanced 3 phase circuits, Power Measurement in single phase & 3 phase circuits..	Talks and presentations	11
5	Transformer:- Construction & working principle of transformer, Emf equation, No load & Full load phasor diagram , Equivalent circuit, Losses & Efficiency, Voltage Regulation, Open circuit & Short Circuit Test on the Transformer	Talks and presentations	13

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To verify Kirchoff's current law and voltage law	Experiments	BL2-Understand	2
1	To verify superposition theorem	Experiments	BL3-Apply	2
2	Measurement Of Active & Reactive power in Single Phase AC circuit and three phase ac circuit	Experiments	BL2-Understand	2
2	Measurement of Impedance of R-L, R-C, R-L-C & study of resonance phenomena	Experiments	BL2-Understand	2
2	Measurement Of Power & Power factor in a Single Phase AC Circuit using Three Ammeter Method	Experiments	BL3-Apply	2
4	Measurement of line quantities and phase quantities in a three phase ac circuit	Experiments	BL4-Analyze	2
5	Study of transformer name plate rating and determination of its transformation ratio	Experiments		2
5	To perform load test on a single-phase transformer	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
Articles	
References Books	Basic Electrical Engg, Sunil S Gaikwad, Dream Tech/ Willey Publication.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	-	-	-	-	-	1	1	1	1	2
CO2	1	1	2	1	1	1	-	1	-	-	1	1	2	3	1
CO3	2	1	2	1	2	-	1	-	-	-	1	1	1	2	2
CO4	1	1	1	2	1	-	-	-	-	-	1	1	3	1	3
CO5	1	1	1	2	1	-	-	-	-	-	1	-	2	2	1
CO6	1	1	1	1	1	-	-	-	-	-	1	1	1	3	2

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Architecture of Electric Vehicle and solar Panels
Course Code	EEL0233

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic understanding of EV & HEV			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Identify various types of EV's and their characteristics**(BL1-Remember)** **CO2-** Describe battery basics and their types in EV and HEV.**(BL2-Understand)** **CO3-** Identify various types of electrical machines used in EV installation.**(BL3-Apply)** **CO4-** Describe Solar panel design and integration. **(BL4-Analyze)** **CO5-** Identify installation and commissioning of solar panel.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Battery electric vehicles, The IC engine/electric hybrid vehicle, fuelled electric vehicles, Electric vehicles using supply lines, Solar powered vehicles, Electric vehicles which use flywheels or super capacitors, Electric Vehicles for the Future	talks and presentations	8
II	Electric Vehicle Operation, Battery Basics, Introduction to Electric Vehicle Batteries, Fuel Cell Technology, Choice of a Battery, ElectricVehicle Body and Frame, Fluids, Lubricants, and Coolants, Effects of Current Density on Battery Formation, Effects of Excessive Heat on Battery Cycle Life, Battery Storage, Battery Capacity	talks and presentations, PBL	8
III	Real-Time Model of a Two-Phase PMSM, PM Brushless DC Machine for EV, Switched Reluctance Motor (SRM) uses in EV, Synchronous Reluctance Motor (SyRM) for EV and HEV, Linear Induction Motor (LIM) – Construction, DC Linear Motor (DCLM) for EV, Analyze the control aspects of brushless DC motor	talks and presentations	9
IV	Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant	talks and presentations, Field visits	8
V	Installation and Trouble shooting of Standalone Solar PV System, Maintenance of Solar PV System, Safety in installation of Solar PV System, Maintenance of Solar PV System. Installation, Commissioning, Trouble shooting of 1KWp off Grid Solar Power Plant, Check list for Solar PV Plant Installation and Commissioning	talks and presentations, PBL	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Familiarization of EV control Modules	Experiments	BL2-Understand	2
I	Study of observer design for EV	Experiments	BL3-Apply	2
III	PI and PID controller for EV	Experiments	BL4-Analyze	2
III	Speed control of DC shunt machine for EV	Experiments	BL5-Evaluate	2
II	Speed control of Induction machine for EV	Experiments	BL5-Evaluate	2
IV	To plot V-I characteristics of solar cell and determine the fill factor	Experiments	BL5-Evaluate	2
IV	Series and parallel connections of solar cells	Experiments	BL5-Evaluate	2
V	Testing of photovoltaic cells	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Vehicle Powertrain Systems by Behrooz Mashadi and David Crolla, Wiley, 2012 2. Automotive Aerodynamics by Joseph Katz, Wiley, 2016 3. Automotive Chassis Engineering, by David C. Barton and John D. Fieldhouse, Springer, 2018 4. Automotive Engineering Powertrain, Chassis System and Vehicle Body Edited by David A. Crolla, Elsevier,2009 5. Automotive Power Transmission Systems by Yi Zhang and Chris Mi, Wiley, 2018 6. Linear Electric Machines, Drives, and MAGLEVs Handbook, by Ion Boldea, CRC Press. 2013
Articles	
References Books	1.Encyclopaedia of Automotive Engineering edited by David Crolla et al, Wiley, 2014 2. Design and Control of Automotive Propulsion Systems by Zongxuan Sun and Guoming Zhu, CRC Press, 2015 3. The Automotive Transmission Book by Robert Fischer, Ferit Küçükay, Gunter Jürgens, Rolf Najork, and Burkhard Pollak, Springer, 2015 4. Noise and Vibration Control in Automotive Bodies by Jian Pang, Wiley, 2019
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan 2.https://nptel.ac.in/courses/108106170 Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi
Videos	1.https://www.youtube.com/watch?v=UgtjRob5qMg&list=PLyqSpQzTE6M9spod-UH7Q69wQ3uRm5thr 2.https://www.youtube.com/watch?v=mNOYS-duUJY

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	1	-	-	1	-	-	-	-	1	-
CO2	-	-	1	-	-	-	1	-	-	1	-	2	-	-	-
CO3	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	1	-	2	-	2	-	-	-	-	-	-	1
CO5	-	-	2	-	-	-	-	-	-	-	1	-	1	-	-
CO6	2	-	-	-	1	-	-	-	3	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Statistics For Engineers
Course Code	MAL0203

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	2	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	statistics for engineers typically include basic mathematics (algebra, calculus), understanding of probability theory, and familiarity with concepts in engineering disciplines. Additionally, knowledge of software tools like MATLAB or Python for data analysis is beneficial.			**Co-Requisite/s**	statistics for engineers may include introductory courses in engineering mechanics, computer programming, and experimental methods. Additionally, concurrent enrollment in courses covering linear algebra and differential equations could provide valuable mathematical background for understanding advanced statistical concepts and applications in engineering contexts.			
Course Outcomes & Bloom's Level	**CO1-** To remember basic concept of about the design data collection plans and basic tools of descriptive statistics.**(BL1-Remember)** **CO2-** To understand the identify relationship between two variables using scatter plot and Interpret a simple correlation. To understand the Knowledge about the different types of continuous distribution with their properties and applications.**(BL2-Understand)** **CO3-** To apply the test and make hypothesis by Student's t-test, F-test, chi-square test, Z test, goodness of fit.**(BL3-Apply)** **CO4-** To analyze the concept of sampling distribution of a statistic and its properties, difference between parameter and statistic.**(BL4-Analyze)** **CO5-** To evaluate and describe the properties of unbiasedness. Also identifying and provide an application the null hypothesis, alternative hypothesis and test statistic.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	tInroduction to statistics and data analysis Measures of central tendency, Measures of variability, [Moments, Skewness, Kurtosis (Concepts only)]. Correlation and Regression, Partial and Multiple correlations, Multiple regressions.	Audio/Video clips, group discussion, lecture with ppt, quiz	10
2	Introduction, random variables, Probability mass Function, distribution and density functions, joint Probability distribution and joint density functions, Marginal, conditional distribution and density functions, Mathematical expectation, and its properties Covariance, moment generating function, characteristic function.	Audio/Video clips, group discussion, lecture with ppt, Review Analysis	10
3	Binomial and Poisson distributions, Normal distribution, Gamma distribution, Exponential distribution.	Audio/Video clips, group discussion, lecture with ppt, classroom presentations, Analysis	6
4	Testing of hypothesis, Introduction, Types of errors, critical region, procedure of testing hypothesis, Large sample tests, Z test for Single Proportion, Difference of Proportion, mean and difference of means.	Audio/Video clips, group discussion, lecture with ppt, quiz	8
5	Small sample tests, Student's t-test, F-test, chi-square test, goodness of fit, independence of attributes, Design of Experiments, Analysis of variance, one and two way classifications, CRD, RBD, LSD.	Audio/Video clips, group discussion, lecture with ppt, quiz	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Introduction: Understanding Data types; importing/exporting data.	Experiments	BL2-Understand	2
2	Computing Summary Statistics/plotting and visualizing data using Tabulation and Graphical Representations.	Experiments	BL3-Apply	2
3	Applying correlation and simple linear regression model to real dataset; Computing and interpreting the coefficient of determination	Experiments	BL3-Apply	2
4	Applying multiple linear regression model to real data set; computing and interpreting the multiple coefficient of determination	Experiments	BL3-Apply	2
5	Fitting the following probability distributions: Binomial distribution,	Experiments	BL3-Apply	2
6	Normal distribution Poisson distribution	Experiments	BL3-Apply	2
7	Testing of hypothesis for One sample mean and proportion from real, time problems	Experiments	BL3-Apply	2
8	Testing of hypothesis for Two sample mean and proportion from real, time problems	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	M. Ray, H.S. Sharma, Sanjay Chaudhary Mathematical Statistics Ram Prasad & Sons J.N. Sharma, J.K. Goyal Mathematical Statistics Krishna Prakash and Media (P) Ltd
Articles	
References Books	E.Kreyszig Advanced Engineering Mathematics 8 th Ed., John Wiley and Sons, 1999 B.V. Ramana Higher Engineering Mathematics Tata McGraw Hill B. S. Grewal Higher Engineering Mathematics Khanna Publishers
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ec03/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ec03/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	1	-	-	-	-	1	-	1
CO2	3	3	1	3	3	2	-	1	-	1	-	-	2	-	2
CO3	3	2	-	1	3	-	-	-	-	-	-	-	1	3	2
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	3	1
CO5	2	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Environmental Pollution and global issues
Course Code	MCL0201

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Foundation core							
Pre-Requisite/s	Basic knowledge of natural resources, biodiversity, ecological succession, energy flow, environmental issues and problems.			**Co-Requisite/s**	A detailed understanding of the complexity of environment and its challenges and solutions to these problems and challenges.			
Course Outcomes & Bloom's Level	**CO1-** CO1. Develop environmental scientists and engineers and sensitize them towards environmental issues.**(BL2-Understand)** **CO2-** CO2. To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach**(BL3-Apply)** **CO3-** CO3. Ability to distinguish between various methods of various pollution analysis**(BL4-Analyze)** **CO4-** CO4.Acquire expertise and skills needed for the Environmental Management Systems and techniques of monitoring, Environment audit, Environmental Impact Analysis, environment instrumentation and control systems and for the projects development, implementation, and maintenance.**(BL5-Evaluate)** **CO5-** CO5. Students acquire skills for to communicate, prepare, plan and implement the environmental management project**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✓ Environment ✓		**SDG (Goals)**	SDG2(Zero hunger) SDG3(Good health and well-being) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land) SDG16(Peace Justice and strong institutions) SDG17(Partnerships for the goals)				

Part B

Modules	Contents	Pedagogy	Hours
Unit – 1 (Environment, Ecosystem and Environmental Education)	Environment – Definition and its segments, (Lithosphere, Hydrosphere, Atmosphere and Biosphere), Multidisciplinary nature of Environmental Science, Ecology and Ecosystem: Basic concepts, functions of ecosystem, Energy Flow, Food chain, food web, Ecological Pyramids, Ecological Successions. Environmental Education-Definition, scope, importance, Need for Public Awareness, Environmental Ethics. Environmental Impact Assessment: Screening, Scoping, Base line Analysis, Impact Mitigation, Documentation, Review, Public hearing, Post Project Monitoring.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, discussion (questions & answers section)	8
Unit – 2 (Natural Resources Management)	Natural Resources – Classification, Water Resources (availability, quality, water budget), Mineral Resources (distribution, availability and future perspectives), and Forest Resources. Energy Resources-Classification and alternatives of conventional energy resources- Solar, working of solar photovoltaic cells, Geothermal, Wind energy, Nuclear Energy, Biomass and Bio-gas	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
Unit – 3 (Water, Soil & Noise Pollution)	Water pollution – sources & effects, characteristics and treatment of waste water, engineered systems for water purification: Aeration, solid separation, settling operations, filtration and disinfection. Soil - formation of soil, elementary and mineral composition, types of soil in India, soil pollution, effects and abatements. Noise Hazards: Continuous and impulse noise, Effect of noise on man, Measurement and evaluation of Noise, noise isolation and absorption techniques, silencers, practical aspects of noise.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion.	8
Unit –4 (Atmospheric chemistry and Air Pollution)	Classification, sources and toxic effects of air pollutants, dispersal of air pollutants, engineered systems for air purification: Atmospheric cleansing process, approaches to contamination control. Air pollutants with emphasis on reactive intermediates in atmosphere like hydroxyl radical, ozone and nitrate radical, types of hydrocarbon in the troposphere, reaction of organic compounds in the atmosphere.(Green house gas effect, Global warming, Climate change).	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures,Audio/Video clips, Group discussion.	8
Unit – 5 (Waste Management)	Solid waste: Generation and waste characterization. Collection, storage and transport. Waste disposal, waste processing techniques, reduction, reuse and recycling, resource recovery and utilization. Physical and chemical treatment methods and composting. Hazardous waste management and treatment.	Lecture with ppt., Diagrams, Flowchart depiction on whiteboard during online/offline lectures, Audio/Video clips, Group discussion. Field visits. Industrial Visit (MSW/BMW/STP/ETP)	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		60	30	40	20
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Environmental Science by B. S. Chauhan; Firewall Media, 2008 • Environmental Science by Cuningham and Cuningham; McGraw-Hill Education; 13th edition (16 February 2014) • Environmental Engineering by S. K. Dhameja; S. K. Kataria & Sons, 2009 • Environmental Science by Richard T Wright; Benjamin-Cummings Pub Co.
Articles	
References Books	Environmental Engineering by Howards S Peavy, Donald R Rowe, T. George • Environmental Science & Engineering by Gilbert M. Master • Environmental Chemistry by Stanley
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Making of modern India
Course Code	MCL0202

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">1st</td><td rowspan="2">Semester</td><td rowspan="2">2nd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Humanities, Social Sciences and Management</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="4">Basic knowledge of social sciences and political sciences.</td><td colspan="2">Co-Requisite/s</td><td colspan="2"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- At the end of this course, students would be intellectually well equipped to have a sense of modern Indian history and culture.(BL1-Remember)
CO2- The students will have an understanding of making of India as a nation and salient features of modern India(BL2-Understand)
CO3- It will help students to develop their personality and thinking horizon for being a good and concerned Indian citizen(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✕
Entrepreneurship ✕
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✓
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)
SDG5(Gender equality)
SDG15(Life on land)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
I	Idea of India in historical perspective a) Indian culture, b) cultural commonness, c)cultural diversities, d)unity in diversity, e) cultural accommodations ,f) cultural conflicts, g)Idea of India and British Rule , h) Role of Indian Intelligentsia.	Lecture Method	6
II	Emergence and growth of Indian Nationalism a) Anti-colonial basis, b) Economic Nationalism, c) communalism and nationalism, d) revivalism and Indian nationalism, e)Enlightenment values, f)European Nationalism and Indian Nationalism.	Lecture Method	6
III	Social Reform Movements (a) British Rule and Indian introspection, (b) Raja Rammohan Roy, (c) social reform movements in 19th century, (d)Swami Vivekanand, (e)The women issue, (f)Caste system.	Lecture Method	6
IV	Indian National Movement (a) Early Revolts and 1857 Revolt, (b)Early Nationalists, (c) Bang Bhang Movement ,(d) Gandhi led Mass Movements, (e) Socialist and Left trends, (f) Princely States and their integration into nation, (h)Partition and Independence .	Lecture Method	6
V	India after independence a) Making of Indian Constitution, (b) Post Independent Nehru Era, (c) India facing Wars, (d) Indian economy- From Planning to LPG, (e) Achievements, (f) Challenges in 21st century India.	Lecture Method	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	60		40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			

Part E

Books	1. Bipan Chandra and others: India's Struggle For Independence , Penguine Publishers. 2. Bipan Chandra: History Of Modern India, Orient Blackswan publishers. 3. Sunil Khilnani: The Idea of India, Penguine publishers. 4. Shekhar Bandopadhyay: From Plastic to Partition and After, A History of Modern India, Orient Blackswan publishers. 5. Rakesh Batabyal: The Penguine Book of Modern Indian Speeches,1878 to Present, Penguine Publishers. 6. A R Desai:Social Background of Indian Nationalism, Popular Prakashan . 7. B R Nanda: Mahatma Gandhi ,A Biography,London.
Articles	
References Books	1. B.R.Nanda:Gandhi and His Critics, Oxford 2. Girja Shankar: Socialist Trends in Indian National Movement ,Meerut 3. Urmila Phadnis:Towards the integration of Indian States,1919-1947,Mumbai 4. Bimal Prasad: Gandhi,Nehru and JP,A Study in Leadership,New Delhi 5. Bipan Chandra and others:India Since Independence ,Penguine 6. Ramchandra Guha:Makers of Modern India, Penguine. 17. Austin Granville: The Indian Constitution, Oxford
MOOC Courses	https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/61
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	1	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Engineering Graphics
Course Code	MEL0202

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">1st</td><td rowspan="2">Semester</td><td rowspan="2">2nd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Basic knowledge of geometrical construction, sketching, imagination etc.</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To get the fundamentals of engineering graphics, geometrical construction and its applications.(BL1-Remember)
CO2- To understand the basic concept of engineering graphics through real-life examples. (BL2-Understand)
CO3- To implement the different engineering graphics concepts over appropriate drawing dataset. (BL3-Apply)
CO4- To analyze the drawing performance of engineering graphics techniques.(BL4-Analyze)
CO5- To evaluate the drawing performance of engineering graphics techniques on a corresponding object.(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	1. Drafting tools, 2. Principles of Graphics, 3. Geometrical constructions 4. Scales: Plain, diagonal, 5. Curves used in engineering practice: such as ellipse, parabola, hyperbola by different methods. Cycloidal curves, Involutes and Spirals.	Lecture Method/Video	8
Unit-2	1. Types of projection, Orthographic projections, First angle and third angle projection. 2. Projections of points in different quadrants. Projections of lines, True inclination and true length of straight line, Traces.	Lecture Method	8
Unit-3	Projections of planes: Perpendicular plane, oblique plane and Auxiliary plane, projection of planes with inclined to one or both the reference planes and traces of planes.	Lecture Method	8
Unit-4	1. Projection of solids: Polyhedron and solids of revolution, projection of solids with inclined to one or both the reference planes. 2. Introduction to Section of solids and Development of surfaces.	Lecture Method	8
Unit-5	1. Isometric projection: Isometric scale, isometric projections from orthographic drawing. 2. Computer Aided Drafting (CAD): Introduction, benefit, software's, basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.	Lecture Method	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Drawing sheet of plane scale.	Experiments	BL3-Apply	2
Experiment -2	Drawing sheet of diagonal scale.	PBL	BL3-Apply	2
Experiment -3	Drawing sheet of ellipse.	PBL	BL3-Apply	2
Experiment -4	Drawing sheet parabola and hyperbola	PBL	BL3-Apply	2
Experiment -5	Drawing sheet of cycloidal curves.		BL3-Apply	2
Experiment -6	Drawing sheet of orthographic projection		BL3-Apply	2
Experiment -7	Drawing sheet of projection of line		BL3-Apply	2
Experiment -8	Drawing sheet of projection of plane.		BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. N.D.Bhatt Elementary of Enginnering Drawing Charotar Publication P.S. Gill Engineering Drawing Kataria Publication Agrawal and Agrawal Engineering Drawing TMH
Articles	
References Books	Venu Gopal K Engineering Drawing New age K.L. Narayana& P. Kannaiah Engineering Drawing SCITECH Pub.
MOOC Courses	https://nptel.ac.in/courses/112103019
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	2	2	1	2	-	-	3	3	-	-	3	2	2
CO3	-	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Object Oriented Programming by Java
Course Code	CSP0303

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic principles of the object-oriented programming **(BL1-Remember)** **CO2-** Understand the basic concept of the object-oriented programming **(BL2-Understand)** **CO3-** Apply the logic of oops in java **(BL3-Apply)** **CO4-** Able to Analyze inheritance and abstraction **(BL4-Analyze)** **CO5-** Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Objects and Classes: Introduction of Eclipse software ,Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Inheritance: Inheritance in java, Super and sub class, Overriding, Object class,.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Abstract class, Interface in java, Package in java, UTIL package., encapsulated	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Program to define a structure of a basic JAVA program	Experiments	BL4-Analyze	2
2	Program to define student class with user input	Experiments	BL4-Analyze	2
3	Program to define student class without user input	Experiments	BL4-Analyze	2
4	Program to define class and constructors	Experiments	BL4-Analyze	2
5	Program to define class, methods and objects. Demonstrate method overloading.	Experiments	BL4-Analyze	2
6	Program to define inheritance and show method overriding.	Experiments	BL4-Analyze	2
7	Program to define inheritance with .superclass	Experiments	BL4-Analyze	2
8	Program to define abstraction	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	1) Daniel Liang, Seventh Edition, Pearson, introduction to Java Programming(Comprehensive Version) Seventh Edition, Pearson.
Articles	https://www.irjet.net/archives/V7/i10/IRJET-V7I10247.pdf
References Books	1) Sachin Malhotra & Saurabh Chaudhary, Programming in Java Oxford University Press.
MOOC Courses	https://www.coursera.org/courses?query=object%20oriented%20programming
Videos	https://archive.nptel.ac.in/courses/106/105/106105153/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	-	-	-	2	2	2
CO2	1	1	-	2	2	2	-	-	-	-	-	-	2	2	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	2	3	2
CO4	2	1	1	2	1	-	-	-	-	-	-	-	3	2	3
CO5	1	-	-	2	1	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Circuit Theory and Networks
Course Code	EEL0302

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">3rd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Minor</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- • To introduce different circuit elements and theorems(BL1-Remember)
CO2- • To find out different circuit parameters(BL3-Apply)
CO3- • Implement theorems and logic in analysis of circuits(BL3-Apply)
CO4- • Familiarize with steady state and transient analysis(BL2-Understand)
CO5- Circuit implementation or design.(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, Network Theorems for AC & DC circuits- Thevenins & Norton's, Superposition's, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources .	Talks and presentations	12
2	Steady state analysis: Concept of phasor & vector, impedance & admittance, tuned circuits, Series & parallel resonance. Analysis of magnetically coupled circuits, coupling coefficient and Dot convention.	Talks and presentations	12
3	Transient analysis: Transients in RL, RC & RLC Circuits, initial conditions, time constants	Talks and presentations	12
4	Laplace transform and its Applications, solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.	Talks and presentations	11
5	Network function & Two port networks: concept of complex frequency, Network & Transfer functions for one port & two ports, Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.	Talks and presentations	13

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Text Books: 1. M.E. Van Valkenburg, Network Analysis, (PHI) 2. Pankaj Swarnkar,Network Analysis and Synthesis;Satya Prakashan
Articles	
References Books	References: 1. F.F.Kuo, Network Analysis. 2. Mittal GK; Network Analysis; Khanna Publisher 3. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson. 4. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH 5. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH 6. Decarlo lin; Linear circuit Analysis; Oxford 7. William D Stanley : Network Analysis with Applications, Pearson Education 8. Roy Choudhary D; Network and systems; New Age Pub 9. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH 10. Chakraborti :Circuit theory: Dhanpat Rai 11. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand 12. Nilson & Riedel , Electric circuits ;Pearson
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	-	1	1	2	2	3
CO2	1	1	1	1	1	1	-	-	-	-	1	-	3	3	2
CO3	1	1	1	1	1	1	-	-	-	-	1	1	3	2	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	3	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical & Electronic Materials
Course Code	EEL0304

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">3rd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Minor</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- to understand different conducting materials (BL2-Understand)
CO2- to understand different semiconducting materials(BL2-Understand)
CO3- to understand different magnetic materials(BL2-Understand)
CO4- to understand different insulating materials(BL2-Understand)
CO5- to classify different materials(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✓</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Conducting Material: Classification and main properties, High resistivity alloy: Constantan Manganin, Nichrome, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercury, Nickel, Titanium, Carbon, Lead, thermocouple, materials, specific resistance, conductance, variation of resistance with temperature, super conductors.	Talks and presentations	10
2	Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical charge, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, (forward and reverse) of P-n junction, Reverse separation current.	Talks and presentations	9
3	Magnetic Materials: Details of magnetic materials, relation between B. H. and μ, soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysteresis loss, eddy current loss, Magnetization, magnetic susceptibility, coercive force, core temperature, rectangular hysteresis loops.	Talks and presentations	8
4	Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permittivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.	Talks and presentations	9
5	Classification of insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, Bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.	Talks and presentations	9

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Text Books: 1. A.J.Dekker: Electrical Engineering Materials PHI 2. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand
Articles	
References Books	References: 1. Kortisky; Electrical Engineering Materials: 2. Electrical Engineering Material s & Devices; John Allison ;TMH 3. Materials for Electrical Engineering: B.M. Tareev. 4. Anderson; Di-Electrics :
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Energy Storage Systems for electric vehicles
Course Code	EEL0334

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">3rd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>1</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Basics of vehicle mechanism</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Understand the basic history of electric vehicles.(BL1-Remember)
CO2- Discuss the various energy storage systems(BL2-Understand)
CO3- Analyze the battery characteristics & parameters(BL3-Apply)
CO4- Enlighten the battery management system(BL5-Evaluate)
CO5- Apply the knowledge battery testing, disposal & recycling to avoid environmental pollution for the betterment of society(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✓</td><td>SDG (Goals)</td><td colspan="4">SDG7(Affordable and clean energy)
SDG8(Decent work and economic growth)
SDG9(Industry Innovation and Infrastructure)
SDG11(Sustainable cities and economies)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
I	Energy storage systems overview - Scope of energy storage, needs and opportunities in energy storage, Technology overview and key disciplines, comparison of time scale of storages and applications, Energy storage in the power and transportation sectors. Importance of energy storage systems in electric vehicles, Current electric vehicle market.	talks and presentations	7
II	Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System.	talks and presentations	8
III	20.05.2022 2/3 Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design- Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance	talks and presentations	9
IV	Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests.	Chalk and talk/power point presentation,Videos/Learning material	9
V	Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process.	talks and presentations	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Develop a comparative case Study of different types of batteries with their characteristics & detailed specifications.	Experiments	BL2-Understand	2
II	Perform Vibration Test for traction batteries (Lead-Acid/Li-ion) as per AIS 048 standard.	Experiments	BL4-Analyze	2
II	Perform Shock Test for traction batteries (Lead-Acid/Li-ion) as per AIS 048 standard.	Experiments	BL5-Evaluate	2
III	SOC Estimation by Open Source voltage for Lead-Acid battery, Ni-MH battery and Liion battery	Experiments	BL4-Analyze	2
III	SOC Estimation by specific gravity for Lead-Acid battery.	Experiments	BL5-Evaluate	2
IV	Design a circuit for Battery monitoring System for Lead acid battery.	Experiments	BL4-Analyze	2
V	Series connection of batteries.	Experiments	BL5-Evaluate	2
V	Prallel connection of batteries	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Energy Resource Management, Krupal Singh Jogi (Sarup & Sons). 2. Non-Conventional Energy resources, Dr. B.H. Khan, Tata McGraw Hill. 3. Electrochemical Energy Storage: Physics and Chemistry of Batteries, De Gryuter, Reinhart Job. 4. Batteries: Materials Principles and Characterization Methods, Chen Liao, Chemical Sciences and Engineering Division, Argonne National Laboratory, Lemont, USA. 5. Batteries, Fuel Cells, and related Electrochemistry, U.S. Department of Energy, Washington, D.C. 2058
Articles	
References Books	1..Encyclopaedia of Automotive Engineering edited by David Crolla et al, Wiley, 2014 2. Design and Control of Automotive Propulsion Systems by Zongxuan Sun and Guoming Zhu, CRC Press, 2015 3. The Automotive Transmission Book by Robert Fischer, Ferit Küçükay, Gunter Jürgens, Rolf Najork, and Burkhard Pollak, Springer, 2015 4. Noise and Vibration Control in Automotive Bodies by Jian Pang, Wiley.
MOOC Courses	1.https://nptel.ac.in/courses/108106170 2.https://onlinecourses.nptel.ac.in/noc22_ee53/preview
Videos	1.https://www.youtube.com/watch?v=mNOYS-duUJY 2.https://www.youtube.com/watch?v=nrxmQhbZUTc&t=100s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	-	1	1	-	-	-	1	-	1	-
CO2	-	1	-	-	1	-	-	-	1	1	-	-	-	-	-
CO3	2	-	1	-	-	1	-	-	-	-	-	-	-	-	1
CO4	-	-	-	2	-	-	1	-	2	-	-	-	1	-	-
CO5	-	-	-	-	1	-	-	2	-	-	2	-	-	-	-
CO6	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Digital Electronics and Logic Design
Course Code	EEL0340

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">3rd</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Minor</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- to introduces number systems and code systems. (BL2-Understand)
CO2- To explains about Boolean operations and different logic gates(BL2-Understand)
CO3- to understand and explains about the concept of data processing circuits like encoder, decoder, multiplexer and demultiplexer(BL3-Apply)
CO4- to understand about the types of latches and flip-flops(BL2-Understand)
CO5- to design different electronics circuits(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Binary systems and logic gates: Digital Computer and Digital Systems, Number Systems & its conversions, Addition & Subtraction of numbers, Complements, Subtraction using compliments, Binary codes, Binary Storage and Registers, Binary Logic, Integrated Circuits. Boolean Algebra – Definitions, Theorems, Properties & Function, Canonical and Standard forms, Digital logic gates , IC Digital Logic Families.	Talks and presentations	10
2	Simplification of boolean funcions: The map method, Two and three Variable Maps, Four Variable Maps, Five- and Six- Variable Maps, Product of sums simplification, NAND and NOR Implementation, Two level implementation, Don,t–Care Conditions, Tabulation Method, Determination of prime-Implicants, Selection of prime- Implicants.	Talks and presentations	9
3	Combinational logic: Introduction, Design Procedure, Adders, Subtractor, Parity Generator, Code conversion, Analysis procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-OR and Equivalence functions, Magnitude Comparator, Encoder, Decoder, Multiplexers, Demultiplexer, PLA & ROM.	Talks and presentations	8
4	Sequential logic: Introduction, Flip-FLOPS: SR, D, T, JK. Triggering of Flip-FLOPS, Analysis of clocked sequential Circuits, State Reduction and Assignment, Flip-FLOP excitation tables, Conversion between the flip –flops, Design Procedure, Design with state equations.	Talks and presentations	9
5	Registers, counters & memory unit: Registers, Registers with Parallel loading.Shift Registers: SISO, SIPO, PISO, PIPO, Bi-directional and unidirectional shift registers. Applications of Shift Registers. Counters: Ripple counters, Synchronous counters, Mode N Counters, Ring and Johnson counters. Timing Sequences. Memory Unit, Cache. Random Access Memories: SRAM & DRAM.	Talks and presentations	9

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Mano, M.M., Digital Design, Prentice Hall
Articles	
References Books	Reference Book: 1. Fletcher, W.I., Engineering Approach to Digital Design, Prentice Hall of India 2. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH 3. W.H. Gothman : Digital Electronics, PHI. 4. Leach and Malvino : Digital Principles and Applications, TMH
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Industrial Training-I
Course Code	EET0302

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Engage in industry initiatives during their industrial training.**(BL2-Understand)** **CO2-** Discuss the utilization of sophisticated tools and methodologies encountered during industrial training and visits.**(BL4-Analyze)** **CO3-** Engage with industrial personnel and adhere to engineering procedures and discipline mandated by the industry.**(BL5-Evaluate)** **CO4-** Enhance knowledge of overall workplace conduct and cultivate interpersonal and team competencies.**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG4(Quality education) SDG5(Gender equality) SDG7(Affordable and clean energy) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling. Theory & operation of D'arsonal galvanometer. Measurements: Measurement systems, methods of measurement, classification of instruments, Static and Dynamic Characteristics of the instruments, Errors in measurement, Classification of Errors and Error Calibration curve, Loading Effect due to shunt and series connected Instruments.	Lectures with whiteboard/PPT, Recorded video/interactive videos	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	MPEB	Field work	BL3-Apply	40
2	Railways, Gwalior Office	Field work	BL3-Apply	40
3	BHEL	Field work	BL3-Apply	40

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	3
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	3	3
CO5	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Engineering Mathematics
Course Code	MAL0306

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of equations			**Co-Requisite/s**	Basic knowledge of roots			
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to numerical computing, Approximation and error in numerical computations, Numerical solution of algebraic and Transcendental equations. Regula-Falsi method, Newton-Raphson method, Graffes-Root squaring method, Iterative method. Solution of simultaneous linear equation, Gauss-Elimination method, Jacobi's method Gauss- Seidel method Iterative method. Numerical differentiation and integration(Trapezoidal rule Simpson's 1/3rd rule , Simpson's 3/8rule)	lecture with Board , Quiz, Seminar,	8
Unit 2	Difference operators, Interpolation: Newton's forward and backward method, Lagrange method, Central difference interpolation, Numerical solution of ordinary differential equations: Picard's method, Euler method, Modified Euler method and Runge- Kutta Method, Numerical solution of partial differential equation: Elliptic (Laplace Equation), Parabolic (Heat conduction equation)	lecture with Board , Quiz, Seminar,	8
Unit 3	Laplace Transform: Laplace Transform of elementary functions, Laplace Transform of derivatives, integrals and multiplication by t^n and division by t, Inverse Laplace Transform., convolution Theorem (application only), application to solution of differential equations.	lecture with Board , Quiz, Seminar,	8
Unit 4	Fourier transform, Fourier complex transform Fourier integral theorem, Fourier sine and cosine transform of simple function of derivatives, Finite Fourier sine & cosine transform, inverse of Fourier transform, Application to differential equation, solution of one dimensional heat and wave equations through Fourier transform.	lecture with Board , Quiz, Seminar,	8
Unit 5	Transform: Definition of Z -transform, Z-transform of simple sequences. Properties of Z -transform. Initial and final value theorem, Inverse Z -transform, partial fraction method, convolution theorem, residue method, Application to finite difference equation.	lecture with Board , Quiz, Seminar,	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill 2. B.S.Grewal, Higher Engineering Mathematics ,Khanna Publishers 3. H.K.Das and R. Verma, Higher Engineering Mathematics, S.Chand and Company Pvt.Ltd.
Articles	
References Books	1. E.Kreyszig, Advanced Engineering Mathematics ,John Wiley and Sons, 1999 2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers. 3. T. Veerajan and T. Ramachandran, Theory and Problems in Numerical Methods, Tata McGraw Hill
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ma36/preview
Videos	https://onlinecourses.nptel.ac.in/noc24_ma36/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	-	-	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	-	-	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	-	-	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	-	-	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Computer Programming (PYTHON)
Course Code	CSP0405

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the syntax and semantics of Python Programming Language**(BL1-Remember)** **CO2-** Understand the Basic concept of Python Programming **(BL2-Understand)** **CO3-** Apply the concept of Python in ML **(BL3-Apply)** **CO4-** Analysis the use of built-in functions to navigate the file system**(BL4-Analyze)** **CO5-** Implement and evaluate the Python code in project **(BL5-Evaluate)** **CO6-** Appraise the need for working on web scraping **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Python IDE, Introduction to anaconda, python variable declaration, Keywords, Indents in Python, Python input/output operations	Lectures with whiteboard/PPT, Recorded video/interactive videos	5
2	Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.	Lectures with whiteboard/PPT, Recorded video/interactive videos	5
3	Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements	Lectures with whiteboard/PPT, Recorded video/interactive videos	5
4	Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python	Lectures with whiteboard/PPT, Recorded video/interactive videos	5
5	Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, some important File handling functions e.g open(), close(), read(), readline() etc. Modules Concept of modularization, Importance of modules in python, Importing modules, Built in modules (ex: Numpy)	Lectures with whiteboard/PPT, Recorded video/interactive videos	5

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Write a program to add two numbers in python	Experiments	BL5-Evaluate	2
1	Write a Program by using if statement in python	Experiments	BL5-Evaluate	2
2	Write a Program by using while loop in python	Experiments	BL5-Evaluate	2
2	Write a Program by using for loop in python	Experiments	BL5-Evaluate	2
3	Write a program to find whether a number is even or odd	Experiments	BL5-Evaluate	2
3	Write a program to find LCM of a number in python	Experiments	BL5-Evaluate	2
4	Write a Program to print all the prime numbers in an interval	Experiments	BL5-Evaluate	2
4	Write a Program for a simple calculator	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	40				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	0

Part E

Books	Mark Lutz Learn python 5th addition
Articles	
References Books	John M Zelle , Python Programming, Ingram short title
MOOC Courses	
Videos	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	2	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Analog & Digital Communication
Course Code	ECL0427

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">4th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Minor</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- comprehensive knowledge of analog and digital communication;(BL1-Remember)
CO2- understand the modulation and demodulation technologies and apply whenever essential.(BL2-Understand)
CO3- have a practical experience of different communication technologies and can identify and analyze(BL3-Apply)
CO4- practical experience of communication methods and evaluate different process.(BL5-Evaluate)
CO5- develop different project based works and fond solutions(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✕
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction:Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals.Noise: Internal & External Noise, Signal to Noise ratio, Noise Figure, Calculation of Noise. Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, SSB Modulators and Demodulators, Vestigial Side Band (VSB).	Talks and presentations	12
2	Angle Modulation: Angle Modulation; FM and PM waveforms, phase deviation, frequency deviation, modulation index, phase and frequency modulators and demodulators, frequency spectrum of angle modulated waves, bandwidth requirement for angle modulated waves, Average power of angle modulated waves, direct and indirect FM transmitters, FM Receivers, Angle Vs Amplitude modulation, FM Vs PM, FM noise suppression.	Talks and presentations	13
3	Pulse Modulation and Waveform Coding Techniques: Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width modulation, Pulse Position Modulation. Their generation and Demodulation, Digital representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Differential Pulse Code Modulation.	Talks and presentations	11
4	Digital Modulation and Demodulation Techniques: Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Method of generation and detection of coherent & non- coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation.	Talks and presentations	12
5	Information Theory & Coding: Information, entropies(Marginal and Conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity, efficiency of noise free channel , Binary symmetric channel(BSC), Binary erasure channel(BEC), Shannon theorem, Shannon –Hartley Theorem, Shannon Fano and Huffman coding methods and their efficiency, Error control coding, Minimum Hamming distance, Linear block code, Cyclic code and Convolution codes.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Machines-I
Course Code	EEL0405

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	TO KNOWLEDGE ABOUT BASIC PHYSICS AND VARIOUS LAWS			**Co-Requisite/s**	To know about basic electrical engineering			
Course Outcomes & Bloom's Level	**CO1-** Predict the behavior of single phase transformer **(BL1-Remember)** **CO2-** Predict the behavior of three phase transformer**(BL2-Understand)** **CO3-** Predict the behavior of electro mechenical energy conversion**(BL3-Apply)** **CO4-** Predict the behavior of DC machine**(BL4-Analyze)** **CO5-** Predict the behavior of DC motor**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Transformers (single Phase) : Review of single phase transformer . Parallel operation of single phase transformer, Load sharing with equal turns ratio and unequal turns ratio . Sumpner`s test. Different types of transformers including dry type transformer, Auto-transformer construction, working & applications,	Talks and presentations	12
Unit-2	Transformers (Three Phase): Constructional features and working principle of a Three Phase transformer Determination of polarity and connections, (Star/star, star/delta, delta/star, star/zigzag, delta/zigzag, open delta), phasor groups. Effects of unbalanced loading,3-phase to 2- phase transformation, Scott connection, 3-phase to six phase conversion, double star & double delta. 3-winding transformers, Parameter estimation. Applications. Introduction to tap changers and their functions.	Talks and presentations, Solution-based learning	12
Unit-3	Electro-mechanical Energy Conversion - Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems(defining energy & Co-energy),Singly Excited Systems, determination of mechanical force, mechanical energy, torque equation , Doubly excited Systems, Energy stored in magnetic field, electromagnetic torque , Generated emf in machines; torque in machines with cylindrical air gap .	Talks and presentations,Group discussions	12
Unit-4	Direct Current machines: Review of construction, types of armature winding, physical concepts ofwinding pitches, derivation of EMF equation & types of excitation. Armature reaction and its effect on the performance, methods adopted for compensation of armature reaction. . Compensating winding, Commutation and function of commutators. Improvement of commutation: Brush shift and interpoles. Characteristics of DC generator: separately excited, shunt, series and compound generators.	Talks and presentations	12
Unit-5	Direct Current motors: Review of types of DC motors. Torque equation, speed torque characteristics:shunt, series and compound motors. Characteristics of machines , Starting & speed control of DC motors.3-point starter & its step calculation. Speed control by controlling armature resistance, field excitation and armature voltage. Ward-Leonard method of speed control. Losses & efficiency of DC machines, Hopkinson’s & Swinburne’s test.	Talks and presentations	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Constructional features of single phase and three phase transformer	Experiments	BL2-Understand	
2	Polarity test of single phase transformer	Experiments	BL3-Apply	
3	Parallel operation of single phase transformer	Experiments	BL4-Analyze	
4	Back to back or sumpner test of single phase transformer	Experiments	BL4-Analyze	
5	Scott connection	Experiments	BL3-Apply	
6	Constructional features of DC machine	Experiments	BL3-Apply	
7	Load test of DC shunt machine	Experiments	BL5-Evaluate	
8	Swinburne test	Experiments	BL3-Apply	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Electric Machines, I.J. Nagrath & D.P. Kothari, 3/e, TMH Electrical Machinery, P.S. Bhimbra, 6/e, Khanna Publishers Electrical Machines, Ashfaq Husain, Dhanpat Rai & Co. (Pvt.) Ltd.
Articles	
References Books	Electric Machinery A.E. Fitggerald, C.Kingsley Jr and Umans 6th Edition McGraw Hill, International Student Edition M.G. Say, “The Performance and Design of AC machines”, Pit man & Sons. Electrical Technology Vol-II , B.L. Thareja
MOOC Courses	1.Applied Linear Algebra for Signal Processing, Data Analytics and Machine Learning, Electrical Engineering, Prof. Aditya K. Jagannatha, IIT Kanpur https://archive.nptel.ac.in/courses/108/104/108104174/ 2. Electrical Equipment and Machines: Finite Element Analysis Electrical Engineering Prof. Shrikrishna V. Kulkarni IIT Bombay https://archive.nptel.ac.in/courses/108/101/108101167/
Videos	1.https://www.youtube.com/playlist?list=PLuUdFsbOK_8qVROrfl2M2WSV2xAz-ABVU 2. https://www.youtube.com/watch?v=PGihCyWoVGE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	-	1	-	-	1	1	2	3	2
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO3	1	1	-	1	1	1	-	-	-	-	1	1	3	2	3
CO4	1	1	1	-	1	1	-	-	-	-	1	1	2	2	3
CO5	1	1	1	1	1	1	1	-	-	-	-	1	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Machines-I
Course Code	EEL0405

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">4th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">To knowledge about basic connections</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8"></td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Constructional features of single phase and three phase transformer	Experiments	BL2-Understand	2
Experiment-2	Polarity test of single phase transformer	Experiments	BL3-Apply	2
Experiment-3	Parallel operation of single phase transformer	Experiments	BL4-Analyze	2
Experiment-4	Back to back or sumpner test of single phase transformer	Experiments	BL5-Evaluate	2
Experiment-5	Scott connection	Experiments	BL3-Apply	2
Experiment-6	Constructional features of DC machine	Experiments	BL2-Understand	2
Experiment-7	Load test of DC shunt machine	Experiments	BL3-Apply	2
Experiment-8	Swinburne test	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Instrumentation
Course Code	EEL0430

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Knowledge of basic measuring instruments and their units.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Classify the standard devices and galvanometers for the measurement of voltage and current.**(BL1-Remember)** **CO2-** Construct the watt-meter and energy meter to measure power and energy.**(BL2-Understand)** **CO3-** Construct instrumentation transformer to measure high values of current and voltage. **(BL3-Apply)** **CO4-** Analyze the bridges for the measurement of low, medium and high resistance. **(BL4-Analyze)** **CO5-** Analyze the bridges for the measurement of inductance and capacitance measurement;**(BL5-Evaluate)** **CO6-** Construct the potentiometers to measure AC and DC values of unknown voltage**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling. Theory & operation of D'arsonal galvanometer. Measurements: Measurement systems, methods of measurement, classification of instruments, Static and Dynamic Characteristics of the instruments, Errors in measurement, Classification of Errors and Error Calibration curve, Loading Effect due to shunt and series connected Instruments.	Talks and presentations	12
Unit 2	Different types of Ammeter & Voltmeter: PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier & Electro-thermic, Expression for deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier	Talks and presentations	14
Unit 3	Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Active & reactive power measurement in three phase circuits. Measurement of Energy: Single phase induction type energy meter – construction & operation – driving and braking torques – errors & compensations – Testing by phantom loading, Three phase energy meter.	Talks and presentations	10
Unit 4	Miscellaneous Instruments & Measurements: Power factor meter, Single phase and three phase Electro-dynamometer type & moving iron type. Frequency meter – Vibrating reed, Resonance type & Weston type, Resistance Measurement – Classification of low, medium & high resistance – Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement, Megger.	Talks and presentations	11
Unit 5	Instrument transformers: Potential and current transformers, ratio and phase angle errors, Difference between CT and PT, errors and reduction of errors.	Talks and presentations	13

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Exp-1	Study of Multimeter & Measurement of Various Electrical quantity	Experiments	BL2-Understand	2
Exp-2	Calibration of Wattmeter with the help of Standard Voltmeter and Ammeter	Experiments	BL3-Apply	2
Exp-3	Measurement of Power and Power factor in a three phase circuit by two wattmeter method	Experiments	BL5-Evaluate	2
Exp-4	Calibration of Wattmeter with help of standard voltmeter and Ammeter	Experiments	BL3-Apply	2
Exp-5	Study and Measurement of insulation resistance using Megger.	Experiments	BL5-Evaluate	2
Exp-6	Measurement of Medium resistance by Wheatstone bridge	Experiments	BL5-Evaluate	2
Exp-7	Measurement of Low Resistance by Kelvin Double Bridge	Experiments	BL5-Evaluate	2
Exp-8	Study of Potential Transformer & related measurements	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	A.K. Sawhney Electrical & Electronic Measurements & Instrument Dhanpat Rai & Sons Pub
Articles	
References Books	1.E W Golding & F C Widdis Electrical Measurement & Measuring Instruments Wheeler Pub
MOOC Courses	
Videos	1.https://www.youtube.com/watch?v=7if7MSqiepg2 2.https://www.youtube.com/watch?v=h8BlWgE8bH0 3.https://www.youtube.com/watch?v=BOJqnvvWauE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	1	-	1	1	1	2	2
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO3	1	-	1	1	-	1	1	-	-	1	1	-	3	3	2
CO4	1	1	1	1	1	1	1	-	-	-	1	1	2	2	3
CO5	1	1	1	1	1	1	1	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Instrumentation
Course Code	EEL0430

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	Study of Multimeter & Measurement of Various Electrical quantity	Experiments	BL2-Understand	2
Experiment 2	Calibration of Wattmeter with the help of Standard Voltmeter and Ammeter	Experiments	BL3-Apply	2
Experiment 3	Measurement of Power and Power factor in a three phase circuit by two wattmeter method	Experiments	BL3-Apply	2
Experiment 4	Calibration of Wattmeter with help of standard voltmeter and Ammeter	Experiments	BL3-Apply	2
Experiment 5	Study and Measurement of insulation resistance using Megger.	Experiments	BL4-Analyze	2
Experiment 6	Measurement of Medium resistance by Wheatstone bridge	Experiments	BL3-Apply	2
Experiment 7	Measurement of Low Resistance by Kelvin Double Bridge	Experiments	BL3-Apply	2
Experiment 8	Study of Potential Transformer & related measurements	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electric and Hybrid Vehicles
Course Code	EEL0435

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">2nd</td><td rowspan="2">Semester</td><td rowspan="2">4th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td>6</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Basic understanding of EV</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources(BL1-Remember)
CO2- Design and develop basic schemes of electric vehicles and hybrid electric vehicles(BL2-Understand)
CO3- Choose proper energy storage systems for vehicle application(BL3-Apply)
CO4- Identify various communication protocols and technologies used in vehicle networks(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✕
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG7(Affordable and clean energy)
SDG11(Sustainable cities and economies)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to Hybrid Electric Vehicles: History of Hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.	talks and presentation	9
II	Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.	talks and presentation	8
III	Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives	talks and presentation, PBL	9
IV	Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power ,electronics, selecting the energy storage technology	talks and presentation, PBL	8
V	Communications, supporting subsystems: In vehicle networks- CAN, Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies	talks and presentation	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
III	Vector control of PMSM and IM drives over complete drive cycle of EV	Experiments	BL5-Evaluate	2
III	Characterization of power, torque and efficiency for EV over drive cycle	Experiments	BL5-Evaluate	2
II	Power flow in EV power train during charging, V2G feeding, motoring and braking	Experiments	BL4-Analyze	2
IV	Forward & backward motoring and regenerative braking of EV consisting of multiple motor- drives	Experiments	BL3-Apply	2
V	Synchronized PWM techniques for high-power and high-speed IM drives	Experiments	BL2-Understand	2
V	Working with the CAN communication	Experiments	BL2-Understand	2
I	Experiments on Type-I onboard charger	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Tom Denton, “Automotive Electrical and Electronic Systems”, 5th Edition, Routledge 2.Tom Denton, “Automotive Electrical and Electronic Systems”, 5th Edition, Routledge 3.Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
Articles	1.E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, “Energy storage devices for future hybrid electric vehicles,” J. Power Sources, vol. 168, no. 1, pp. 2–11, 2007
References Books	1.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi 2.https://nptel.ac.in/courses/108106170 Institute Logo NOC:Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan
Videos	1.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press 2.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press 3.https://www.youtube.com/watch?v=CWulQ1ZSE3c

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	2	-	1	-	1	1	1	-	1	-	-
CO2	-	-	1	1	-	1	-	-	2	-	-	-	-	-	1
CO3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	1	-	-	-	1	-	-	-	1	-	1	-
CO5	-	-	-	-	-	1	-	-	-	1	-	1	-	-	-
CO6	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power Generation Transmission and Distribution
Course Code	EEL0441

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** understand the scenario and structure of power system**(BL1-Remember)** **CO2-** set up the substation and its maintenance, power station maintenance **(BL2-Understand)** **CO3-** the load flow, volume calculation of conductor and the components required in power system**(BL3-Apply)** **CO4-** can evaluate the power generation value, transmission and distribution system capacity**(BL4-Analyze)** **CO5-** create a business continuity plan**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Unit – 1 Sources of electrical Energy ,elementary idea of conventional and non conventional sources Basic features & Comparison of various power plants Structure of Electric power system major components of power systems , variable load on power stations, elementary idea of load curves, load duration curve, terminology of power engineering , Power system scenario in india	Talks and presentations	15
2	Transmission systems : Electric supply systems , comparison of AC & DC supply systems, advantages of high transmission voltage, Comparison of conducting material in underground supply system comparison of transmission elements of transmission line. Economic choice of conductor size, transmission voltage	Talks and presentations	10
3	Types of Conductors&Line Parameters: calculation of inductance Resistance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Skin Effect And Proximity Effect Generalized ABCD constants and equivalent circuits of short, medium & long lines.	Talks and presentations,Group discussions	12
4	Representation of power system components: single phase solution of balanced three phase Networks, the one line diagram or the impedance or reactance diagram, per unit system, complex power, representation of loads, characteristics and performance of a short medium and long transmission line, Ferranti effect , tuned power lines, power flow through a transmission line, methods of voltage control.	Talks and presentations	11
5	Mechanical Design of Transmission lines: different types of tower, sag calculation, string chart vibration dampers, line supports, spacing of conductors and ground, corona loss and its effects cables: classification, construction and characteristics, types, insulation resistance and capacitance, grading, laying, jointing. phenomenon of dielectric stress and sheath loss	talks and presentation	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Power System Engineering - Nagrath and Kothari
Articles	
References Books	Modem Power System Practice", Volume 1 to 8, Central Electricity Generating Board
MOOC Courses	1.Power System Protection Electrical Engineering Prof. Ashok Kumar Pradhan IIT Kharagpur 2.Power System Protection and Switchgear Electrical Engineering Prof. Bhaveshkumar R. Bhalja IIT Roorkee 3. Power Transmission Systems Electrical Engineering Prof. Krishna S IIT Madras
Videos	1.https://www.youtube.com/watch?v=zeSEFsR-jZA 2.https://www.youtube.com/watch?v=M8Y-1g47UpU 3.https://www.youtube.com/playlist?list=PL5TKV1tzb09lKvDmGWkJ8XtoxulLI8TF8

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	3
CO3	1	-	1	1	-	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	-	1	2	3	3
CO5	1	1	-	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Machine-II
Course Code	EEL 0507

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	To knowledge about basic connection of electrical circuits			**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Load test of single phase induction motor	Experiments	BL2-Understand	2
Experiment-2	speed control of induction motor by v/f method	Experiments	BL3-Apply	2
Experiment-3	Load test of squirrel cage IM	Experiments	BL4-Analyze	2
Experiment-4	Load test of slip ring IM	Experiments	BL5-Evaluate	2
Experiment-5	V and inverted v-curve of synchronous motor	Experiments	BL5-Evaluate	2
Experiment-6	constructional features of single phase IM	Experiments	BL2-Understand	2
Experiment-7	constructional features of three phase IM	Experiments	BL2-Understand	2
Experiment-8	constructional features of synchronous machine	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Machine-II
Course Code	EEL 0507

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge about generalized principles of rotating machines			**Co-Requisite/s**	Basic connection knowledge			
Course Outcomes & Bloom's Level	**CO1-** To remember various aspects of Electrical Machines.**(BL1-Remember)** **CO2-** To understand Static and rotating machines.**(BL2-Understand)** **CO3-** To implement Flow charts and practice set to understand the subject.**(BL3-Apply)** **CO4-** To analyze the different numeric problems for well understand subjects problems. **(BL4-Analyze)** **CO5-** To evaluate and summarize the data using statistical & visualization tools.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Three phase Induction Machine – I Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, No load & blocked rotor tests,, efficiency, Induction generator & its applications.	Talks and presentations	12
Unit-2	Three phase Induction Machine- II Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.). Speed control of induction motors: Variation of supply voltage, rotor resistance control, cascading, slip power recovery scheme, pole changing, .	Talks and presentations	12
Unit-3	Single phase Induction Motor: Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor AC Commutator Motors: Universal motor, Single phase a.c. series compensated motor, stepper motors	Talks and presentations	12
Unit-4	Synchronous Machine- I Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, , Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient	Talks and presentations	12
Unit-5	Synchronous Machine- II Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, operating Characteristics Synchronous Motor: Starting methods, Effect of varying field current at different loads, V- Curves, Hunting & damping, synchronous condenser	Talks and presentations	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Implementation of rectifying circuit for mobile charging.	PBL	BL6-Create	8
2	Load test of single phase induction motor	Experiments	BL4-Analyze	2
3	speed control of induction motor by v/f method	Experiments	BL3-Apply	2
4	Load test of squirrel cage IM	Experiments	BL4-Analyze	2
5	Load test of slip ring IM	Experiments	BL4-Analyze	2
6	V and inverted v-curve of synchronous motor	Experiments	BL5-Evaluate	2
7	constructional features of single phase IM	Experiments	BL3-Apply	2
8	constructional features of three phase IM	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	D.P.Kothari & I.J.Nagrath Electric Machines Tata Mc Graw Hill
Articles	
References Books	P.S.Bimbhra Electrical Machinery Khanna Publisher M.G.Say Alternating Current Machines Pitman & Sons B.L. Theraja Electrical Technology S. Chand publication
MOOC Courses	1.Electrical Machines - II,Electrical Engineering,Prof. Tapas Kumar Bhattacharya,IIT Kharagpur https://archive.nptel.ac.in/courses/108/105/108105131/ 2.Modelling and Analysis of Electric Machines Electrical Engineering,Dr. Krishna Vasudevan,IIT Madras https://archive.nptel.ac.in/courses/108/106/108106023/
Videos	1.https://www.youtube.com/watch?v=59HBoIXzX_c 2.https://www.youtube.com/watch?v=b5tc0FrYk60

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO2	1	1	-	1	1	1	-	-	-	-	1	1	3	2	2
CO3	1	-	1	-	1	-	-	-	-	-	1	1	3	2	3
CO4	1	1	1	1	1	1	-	-	-	-	1	-	3	3	3
CO5	1	1	1	1	1	1	-	-	-	-	-	1	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power System Stability
Course Code	EEL 0542

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">3rd</td><td rowspan="2">Semester</td><td rowspan="2">5th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Able to get the basic know symmetrical components (BL1-Remember)
CO2- Able to understand different type of symmetrical and asymmetrical faults happened in power system(BL2-Understand)
CO3- Able to understand stability of power system(BL3-Apply)
CO4- Able to understand swing equations and equal area criterions(BL4-Analyze)
CO5- Able to understand basics on power system protection system(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG8(Decent work and economic growth)
SDG10(Reduced inequalities)
SDG11(Sustainable cities and economies)
SDG12(Responsible consuption and production)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Symmetrical fault analysis: Transient in Transmission systems, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions. Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks. for various power system components and overall power system	Talks and presentations	15
2	Unsymmetrical fault analysis : Symmetrical component analysis of un symmetrical faults. Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Zubs for analysis of unsymmetrical shunt fault	Talks and presentations	12
3	Power System Stability: Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.	Talks and presentations	13
4	Power System Transients Types of system transients, Travelling waves or propagation of surges .Generation of overvoltage on Transmission lines . Protection of power system apparatus against surges. Insulation coordination	Talks and presentations, group discussions	10
5	Power System Protection: Protective Zones. Relaying element and quality. Current and Voltage transformers. Relay types and characteristics. Relay hardware .Protection of transmission lines. Generator and motor protection .Transformer protection. Sequence Filters. Microprocessor based relaying.	Talks and presentations	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	W. D. Stevenson Jr., 2ndEd. ” Power System Analysis”, McGraw Hill
Articles	
References Books	1.Power System Stability and Control” by P.Kundur 2.Power System Dynamics and Stability” by P.Sauer and M.A.Pai
MOOC Courses	1.Power System Protection and Switchgear Electrical Engineering Prof. Bhaveshkumar R. Bhalja IIT Roorkee 2.DC Power Transmission Systems Electrical Engineering Prof. Krishna S IIT Madras 3.Power System Dynamics, Control and Monitoring Electrical Engineering Prof. Debapriya Das IIT Kharagpur
Videos	1.https://www.youtube.com/watch?v=M8Y-1g47UpU 2.https://www.youtube.com/watch?v=zeSEFsR-jZA 3.https://www.youtube.com/watch?v=bCy62oTr_CQ

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	1	-	1	1	2	1	2
CO2	1	-	1	1	1	-	1	-	-	-	-	-	3	3	2
CO3	1	1	1	1	-	1	1	-	-	-	1	1	2	2	3
CO4	1	1	1	1	-	1	-	1	-	-	1	-	2	3	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	3	2	2
CO6	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Microprocessors & Interfacing
Course Code	EEL0509

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">3rd</td><td rowspan="2">Semester</td><td rowspan="2">5th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Interdisciplinary Major</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- to understand the 8085 PROCESSOR and its architecture(BL2-Understand)
CO2- to understand the 8086 MICROPROCESSOR and its ARCHITECTURE (BL2-Understand)
CO3- to understand the INSTRUCTION SET OF 8086(BL2-Understand)
CO4- to understand INTERFACING DEVICEs(BL2-Understand)
CO5- to understand different INTERFACING AND APPLICATION OF 8085 MICROPROCESSOR (BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	THE 8085 PROCESSOR : Introduction to microprocessors, Overview, History of microprocessor. 8085 microprocessor: Architecture, instruction set, interrupts structure, and Assembly language programming. Timing Diagrams & simple examples, including loops & nested loops	Talks and presentations	12
2	THE 8086 MICROPROCESSOR ARCHITECTURE : Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals	Talks and presentations	13
3	INSTRUCTION SET OF 8086 : Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.	Talks and presentations	11
4	INTERFACING DEVICE : 8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller	Talks and presentations	12
5	INTERFACING AND APPLICATION OF 8085 MICROPROCESSOR : Interfacing issues, Interfacing ADC &DAC, Interfacing memory, Microprocessor-based voltage, current, frequency, power measurement schemes.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd. 2. The Intel Microprocessors 8086- Pentium processor : Brey; PHI
Articles	
References Books	REFERENCE BOOKS: 1. Microprocessors and interfacing : Hall; TMH 2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware & Applications :Triebel & Singh; PHI 3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI. 4. Advanced Microprocessors and Interfacing : Badri Ram; TMH
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electromagnetic Field Theory
Course Code	EEL0510

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Understand electric and magnetic fields and apply the principles of Coulomb's Law and Gauss's law to electric fields in various coordinate systems**(BL1-Remember)** **CO2-** Identify the electrostatic boundary-value problems by application of Poisson's and Laplace's equations**(BL2-Understand)** **CO3-** Understand the depth of static and time-varying electromagnetic field as governed by Maxwell's equations.**(BL3-Apply)** **CO4-** Formulate and analysis problems involving lossy media with planar boundaries using uniform plane waves.**(BL4-Analyze)** **CO5-** Apply concepts of this subject in Antenna Engineering and its applications**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Cartesian Cylindrical Coordinates, Spherical Coordinates Vector Calculus: Differential Length, Area and Volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of vector and Stoke's theorem, Laplacian of a scalar	Talks &Presentations	10
2	Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution' Electric flux density, Gausses' Law-Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields, boundary condition, Poisons and Laplace equations' .	Talks &Presentations	12
3	: Magneto-static fields, Biot-savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential, magnetic boundary conditions..	Lectures,Talks &Presentations	12
4	Maxwell's equation, Faraday's law' transformer and motional electromotive forces, equation of continuity, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence, wave polarization.	Talks &Presentations	14
5	Transmission line parameters, Transmission line equations. Lossless line, Distortion less line, Input impedance, Standing Wave Ratio and Power, The Smith chart, Some applications of transmission lines.	Talks &Presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition 2. Basic Electrical Engg, Mittle&Mittle, TMH 3. Electronics Devices and Circuit Theory-Boylestad&Nashelsky, PHI. 4. Op Amps and Linear integrated Circuits, Ramakant A., Gayakwad, and Prentice Hall Publications.
Articles	
References Books	1. Basic Electrical Engg, Sunil S Gaikwad, Dream Tech/ Willey Publication. 2. Hughes, Electrical and Electronic Technology, Pearson Education IX Edition. 3. Nagrath& Kothari, Basic Electrical Engineering, III Edition TMH.
MOOC Courses	1.https://nptel.ac.in/courses/108106073 Electromagnetic Fields, IIT Madras Prof. Harishankar Ramachandran Coordinators: Prof. Harishankar Ramachandran Department of Electrical EngineeringIIT Madras
Videos	1.https://www.youtube.com/watch?v=a7yGV-2NjCI 2.https://www.youtube.com/watch?v=LPnlqV5dGVI 3.https://www.youtube.com/watch?v=XoVW7CRR5JY

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	-	1	1	1	2	1
CO2	1	1	1	1	1	-	-	-	-	-	-	1	2	3	1
CO3	1	1	1	1	-	1	-	-	-	-	1	-	2	2	1
CO4	1	1	1	1	-	1	-	-	-	-	1	1	2	2	2
CO5	1	1	1	1	1	1	-	-	-	-	1	-	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electric Vehicles Control
Course Code	EEL0536

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of vehicle mechanism			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To study about the motor & device characteristics & parameters.**(BL1-Remember)** **CO2-** To know the various electric drive concepts**(BL2-Understand)** **CO3-** To have a knowledge of DC drive mechanism.**(BL3-Apply)** **CO4-** To have a knowledge of AC drive mechanism.**(BL4-Analyze)** **CO5-** To understand about drives for special electrical machines**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
I	Review of motor principles, motor load dynamics, starting, braking & speed control of dc and ac motors- power semiconductor SCRs, IGBTs and MOSFETs	talks and presentations	8
II	Basic drive, choice of electric drives, advantages, nature and classification of drives, control and stability of electric drives, feedback control of drives, thermal effects in electrical machines, selection of motor and rating.	talks and presentations	8
III	Transient analysis of separately excited dc motors, converter - single phase uncontrolled, half and fully controlled rectifiers, chopper control, closed loop control of solid-state DC drives	talks and presentations	8
IV	Operation of induction and induction motor, direct torque and flux control of induction motor drives, starting methods and speed control of single-phase induction motors, self-controlled synchronous motor drive, selection of motor and rating vector control of synchronous motor.	talks and presentations	8
V	Drives for variable reluctance motors, microprocessor/ microcontroller –gate trigger signal generation applications to special electrical machines, switched reluctance motor drives, brushless DC motor drives, permanent magnet drives.	talks and presentations	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Study of Device Characteristics, linear and switching operations : SCR, Triac, BJT, Mosfet and IGBT. Study of Protection circuits	Experiments	BL2-Understand	2
II	Study of any one Embedded platform (Atmel, STM32, Microchip, TI) for Basic Embedded operations (I/O processing, interrupt processing.	Experiments	BL3-Apply	2
III	MOSFET based Step up and step down converter for low voltage EV loops	Experiments	BL4-Analyze	2
III	Half and full bridge converter and role of control signals for DC moto	Experiments	BL4-Analyze	2
IV	Demonstrating both Current/Voltage loop control of DC motor	Experiments	BL5-Evaluate	2
V	Study of drive schemes and role of control signals for induction motor	Experiments	BL5-Evaluate	2
IV	Demonstrating Control of Induction motor	Experiments	BL4-Analyze	2
V	Demonstrating Control of BLDC /PMSM /SRM moto	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Gopal K D, “Fundamentals of Electric Drives”, Narosa Publishing House Pvt. Ltd., 2011. 2. Pillai S K, “A first course on Electrical Drives”, Wiley Eastern Ltd, Bombay 2011.
Articles	
References Books	1.Ali Elamadi, “Handbook Automotive Power Electronics and Drives”, CRC publishers, 2012. 2. Bimal K Bose, “Modern Power Electronics and Drives”, Elsevier publishers, Butterworth Hinnemann, 2012. 3. Krishnan R, “Permanent Magnet synchronous and Brushless DC Motor Drives”, CRC Publishers, 2010. 4. Krishnan R, “Switched Reluctance Motor Drives: Modeling, Simulation, Analysis, Design and Applications”, CRC Publishers, 2012
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview 2.https://nptel.ac.in/courses/108106170 3. https://nptel.ac.in/courses/108106170 4. https://onlinecourses.nptel.ac.in/noc22_ee53 5. https://onlinecourses.nptel.ac.in/noc21_ee112
Videos	1.https://www.youtube.com/watch?v=nrxmQhbZUTc&t=100s 2.https://www.youtube.com/watch?v=6H5vtu5_SF4

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	1	-	1	-	-	1	-	-	-	-
CO2	-	2	-	-	1	-	1	-	1	-	-	1	-	1	-
CO3	-	1	2	-	-	-	-	-	-	1	-	-	2	-	-
CO4	-	-	-	2	-	2	-	2	-	-	-	2	-	-	-
CO5	2	-	1	-	2	-	1	-	2	-	1	-	-	-	1
CO6	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Engineering Simulation Lab I
Course Code	EEP 0502

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	D.C. Circuit: - Combination of resistance in series & parallel, their solution ,Star –Delta combination, KCL and KVL. Voltage and current sources, dependent and independent sources, source conversion, DC circuit's analysis using mesh & nodal method, Superposition theorem.	Talks and presentations	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Verification of Network Theorems i) Superposition theorem. ii) Thevenin's theorem. iii) Maximum power transfer theorem.	Experiments	BL2-Understand	2
Experiment-2	Transient responses of series RLC, RL, RC circuits with Sine and Step inputs.	Experiments	BL3-Apply	2
Experiment-3	Series and Parallel resonance.	Experiments	BL4-Analyze	2
Experiment-4	Bode plot, Root-locus plot and Nyquist plot	Experiments	BL5-Evaluate	2
Experiment-5	Transfer function analysis of i) Time response of step input ii) Frequency response for sinusoidal input.	PBL		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1-	-	1	1	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO3	1	1	1	1	1	1	-	-	-	-	1	1	3	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	2	2	3
CO5	1	1	-	1	1	1	-	-	-	-	1	1	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Industrial Training-II
Course Code	EET0503

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** The industrial training program aims to equip students and potential employees with practical skills necessary for effectively functioning in an office setting. The main objective of industrial training is to acquire new skills. Students engage in a streamlined learning experience as they go through meticulously crafted modules. The program is designed to provide you with practical experience in the sector, which will enhance your self-assurance and enhance your ability to communicate effectively. Students are given the chance to engage in thorough research and gain expertise in the technology of their preference. Students get practical knowledge of technology's real-world applications through hands-on instruction on live projects. Students acquire knowledge about the latest methodologies and market dynamics through training, which also enables them to stay up-to-date and succeed in interviews. Students get the opportunity to develop robust social profiles and network with prominent figures in the business. It is very beneficial for those who are seeking available opportunities.**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**	SDG7(Affordable and clean energy)					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	MPEB, Madhya Pradesh	Field work	BL3-Apply	40
2	NTPC	Field work	BL3-Apply	40
3	BHEL	Field work	BL3-Apply	40

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	1	1	3	2	2
CO2	1	1	1	-	1	1	-	-	-	-	1	1	3	3	2
CO3	1	1	1	1	1	1	-	-	-	-	-	1	2	3	2
CO4	1	1	-	1	1	1	-	-	-	-	1	1	2	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Mini Project
Course Code	EED 0603

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Examine and cultivate a cognitive approach for delivering a presentation.**(BL2-Understand)** **CO2-** Enhance his linguistic and communicative abilities. **(BL3-Apply)** **CO3-** romote collaboration by cultivating an understanding of alternative perspectives.**(BL4-Analyze)** **CO4-** Stay updated on the most recent advancements in electrical engineering.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Linear Control Systems
Course Code	EEL 0612

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Knowledge of Laplace transform and Fourier transform.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the transfer function model for Physical systems**(BL1-Remember)** **CO2-** Illustrate adequate knowledge in the time response of systems and steady state error analysis..**(BL2-Understand)** **CO3-** Examine the frequency-domain response of closed loop system.**(BL3-Apply)** **CO4-** Build a compensator system satisfying requirements. **(BL4-Analyze)** **CO5-** Analyze the stability of linear systems**(BL5-Evaluate)** **CO6-** Develop state models for linear time invariant system.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Control Systems: Types of control systems, Effect of feedback systems, Transfer functions, Block diagrams, Signal Flow graphs, Mason's gain formula , Differential equations of physical systems – Mechanical systems, Translational systems Rotational systems, Electrical systems, Analogous systems.	Talks and presentations	11
Unit 2	Time Response analysis: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady state errors and error constants. Feedback control actions: Proportional, derivative and integral	Talks and presentations	13
Unit 3	Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh-Hurwitz stability criterion, Relative stability analysis; Special cases of RH criterion. Root locus concepts, construction of root loci	Talks and presentations	12
Unit 4	Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar plots, Bode plots , Effect of adding poles and Zeros. Stability in Frequency Domain: Nyquist stability criterion, assessment of relative stability: gain margin and phase margin.	Talks and presentations	10
Unit 5	Introduction to Design: The design problem and preliminary considerations lead, lag and lead-lag networks , Design of compensating networks. Review of state variable technique: Concepts of state, state variable and state models for electrical systems, Solution of state equations. conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing	Talks and presentations	14

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	study and analysis of stroboscope	Experiments	BL2-Understand	2
Experiment-2	stepper motor application and uses	Experiments	BL3-Apply	2
Experiment-3	servo motor testing	Experiments	BL4-Analyze	2
Experiment-4	Study of P,PI,PID controller	Experiments	BL2-Understand	2
Experiment-5	Uses of function generator	Experiments	BL2-Understand	2
Experiment-6	Compensation design	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Nagrath & Gopal “Control System Engineering”, 4th Edition New age International.
Articles	
References Books	Gopal M Control System : Principles & Design. TMH B.C. Kuo Automatic Control systems PHI
MOOC Courses	1.Advanced Linear Continuous Control Systems: Applications with MATLAB Programming and Simulink Electrical Engineering Prof. Yogesh Vijay Hote IIT Roorkee 2.Nonlinear Control System Electrical Engineering Dr. Arun D. Mahindrakar IIT Madras
Videos	1.https://www.youtube.com/watch?v=HcLYoCmWOjI 2.https://www.youtube.com/watch?v=DtV0ASunhqU 3.https://www.youtube.com/watch?v=XMfH2P2Fc6Q

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	1	1	-	-	-	1	-	-	1	-	-
CO2	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1
CO3	1	-	-	1	-	1	-	-	-	-	-	-	-	1	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	1	1	-	1	1	-	-	-	-	-	-	-	-	-
CO6	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Linear Control Systems
Course Code	EEL 0612

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	study and analysis of stroboscope	Experiments	BL2-Understand	2
Experiment-2	stepper motor application and uses	Experiments	BL3-Apply	2
Experiment-3	servo motor testing	Experiments	BL3-Apply	2
Experiment-4	Study of P,PI,PID controller	Experiments	BL2-Understand	2
Experiment-5	Uses of function generator	Experiments	BL3-Apply	2
Experiment-6	Compensation design	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power System Protection
Course Code	EEL 0643

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** understand the scenario and structure of power system**(BL1-Remember)** **CO2-** set up the substation and its maintenance, power station maintenance **(BL2-Understand)** **CO3-** Predict the behavior of any electrical circuits, Formulate and solve complex Three phase AC circuits. **(BL5-Evaluate)** **CO4-** can evaluate the power generation value, transmission and distribution system capacity**(BL5-Evaluate)** **CO5-** Able to understand basics on power system protection system**(BL2-Understand)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study Characteristics of solid state Over Voltage/Under Voltage Relay	Experiments	BL4-Analyze	2
2	To study Characteristics of Static Type over current Relay	Experiments	BL4-Analyze	2
3	UNDER VOLTAGE RELAY STATIC TYPE	Experiments	BL4-Analyze	2
4	TO STUDY IDMT OVER CURRENT RELAYS SINGLE PHASE AND TO DETERMINE THE PICKUP AND RESET VALUE.	Experiments	BL4-Analyze	2
5	TO STUDY LINE TO LINE FAULT	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	1	-	1	-	-	-	-	1	1	1	1	3
CO2	1	1	1	-	1	1	-	1	-	-	1	1	2	2	1
CO3	1	-	1	1	1	-	1	-	-	-	1	-	1	1	1
CO4	1	1	1	1	1	1	1	-	-	-	1	1	2	1	3
CO5	1	1	1	-	1	1	1	-	-	-	1	-	2	2	3
CO6	1	1	1	1	1	-	1	-	-	-	-	1	3	2	1

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power System Protection
Course Code	EEL 0643

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">3rd</td><td rowspan="2">Semester</td><td rowspan="2">6th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Prerequisites: To understand the contents and successfully complete this course, a participant must have a basic understanding of Storage Systems, Operating systems, Networking and Database.</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To remember various terms and components of power system protection system(BL1-Remember)
CO2- To understand the different components of power system protection and protection procedure of different high cost equipments in the system(BL2-Understand)
CO3- set up the protection system transformer, generator, transmission line and other devices(BL3-Apply)
CO4- To analyze the required components for a particular protection requirement(BL4-Analyze)
CO5- To evaluate the fault and tripping of circuit in the fault case(BL5-Evaluate)
CO6- To create a business continuity plan(BL6-Create)</td></tr>
<tr><td>Coures Elements</td><td colspan="2">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="5"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Relays I: General considerations, sensing of faults, construction of electro-magnetic attraction and induction types relays, Buchholz and negative sequence relay, concept of reset, pick up, inverse time and definite time characteristics,	Talks and presentations	12
Unit-2	Relays II: Over current, over voltage, directional, differential and distance relays on R-X diagram. Static Relays: Introduction, advantage and limitation of static relays, static over current, directional, distance and differential relays	Talks and presentations, ,Brainstorming	12
Unit-3	Protection: Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.). Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection. Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.	Talks and presentations, case study	12
Unit-4	Switchgear I: Theory of current interruption- energy balance and recovery rate theory,. Types of circuit breakers. bulk oil and minimum oil, air break and air blast, sulphur hexa fluride (SF6) and vacuum circuit breakers	Talks and presentations	12
Unit-5	Switchgear II: Rating selection and testing of circuit breakers/operating mechanisms. LT switchgear, HRC fuses, types construction and applications. arc quenching, recovery and restriking voltages , voltage collapse	Talks and presentations, field work	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study Characteristics of solid state Over Voltage/Under Voltage Relay	Experiments	BL4-Analyze	
2	To study Characteristics of Static Type over current Relay	Experiments	BL4-Analyze	
3	UNDER VOLTAGE RELAY STATIC TYPE	Experiments	BL5-Evaluate	
4	TO STUDY IDMT OVER CURRENT RELAYS SINGLE PHASE AND TO DETERMINE THE PICKUP AND RESET VALUE.	Experiments	BL4-Analyze	
5	TO STUDY LINE TO LINE FAULT	Experiments	BL4-Analyze	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	I.J.Nagrath & D.P.kothari Modern Power system Analysis tata mc graw-hill publication company ltd 2nd edition C.L. wadhwa Electrical power systems new age international (p) litmited publishers, 2nd edition 1998
Articles	
References Books	T.J.E miller,john Reactive power control in electric systems wiley&Sons T.K. Nagsarkar, M.S. sukhiz power system analysis oxford university press Elgerd O.I electrical energy systems theory TMH new delhi second edition 1983
MOOC Courses	1.Control and Tuning Methods in Switched Mode Power Converters Electrical Engineering Prof. Santanu Kapat IIT Kharagpur 2.Power System Protection and Switchgear Electrical Engineering Prof. Bhaveshkumar R. Bhalja IIT Roorkee 3.Control and Tuning Methods in Switched Mode Power Converters Electrical Engineering Prof. Santanu Kapat IIT Kharagpur
Videos	1.https://www.youtube.com/watch?v=2vUsMWqBc2g 2.https://www.youtube.com/watch?v=JZueXc4WkIA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	1	1	1	-	-	-	-	1	1	2	2	3
CO2	1	1	1	1	1	1	-	-	-	-	1	1	2	3	3
CO3	1	1	1	-	1	1	-	-	-	-	1	1	3	2	2
CO4	1	1	1	1	1	-	1	-	-	-	1	-	2	3	2
CO5	1	1	1	1	1	1	-	-	-	-	1	1	3	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power Electronics
Course Code	EEL0614

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	02	2
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	basic electrical and electronics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the operation of power electronic devices and its applications.**(BL2-Understand)** **CO2-** Analyze the I-V characteristics of SCR, DIAC and TRIAC. **(BL4-Analyze)** **CO3-** Analyze the characteristics of MOSFET, IGBT and UJT.**(BL4-Analyze)** **CO4-** Illustrate the functioning of rectifiers and firing circuits.**(BL5-Evaluate)** **CO5-** Distinguish the speed control of DC motor using converters.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment No.1	R&RC Firing Circuit.	Experiments	BL3-Apply	2
Experiment No.2	Study of parallel inverter.	Experiments	BL4-Analyze	2
Experiment No.3	Study of series inverter.	Experiments	BL4-Analyze	2
Experiment No.4	SCR Characteristics.	Experiments	BL5-Evaluate	2
Experiment No.5	DIAC Characteristics.	Experiments	BL4-Analyze	2
Experiment No.6	TRIAC Characteristics.	Experiments	BL4-Analyze	2
Experiment No.7	UJT Characteristics.	Experiments	BL5-Evaluate	2
Experiment No.8	To draw drain characteristics.	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50		20		30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power Electronics
Course Code	EEL0614

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">3rd</td><td rowspan="2">Semester</td><td rowspan="2">6th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>2</td><td>6</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices(BL1-Remember)
CO2- Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.(BL2-Understand)
CO3- Formulate and analyze a power electronic design at the system level and assess the performance. (BL4-Analyze)
CO4- Acquire knowledge about different AC voltage controllers and their control.(BL5-Evaluate)
CO5- Study the basics of Cyclo converters. (BL4-Analyze)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG8(Decent work and economic growth)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Power diodes, Power Transistors, Power MOSFET, GTO, TRIAC, DIAC, IGBT, LASCR, MCTs, Construction and Principle of Operation of SCR, Static V-I Characteristics, Turn-on Methods, Two Transistor Analogy, Commutation Techniques, Firing circuits, Thyristor types rating and protection, Design of snubber circuit, Series and Parallel Operation of SCR.	Lectures	11
2	Rectifiers Operation and analysis of Single phase (Half wave and Full wave) controlled rectifier circuit with Resistive, Resistive- Inductive Load and RLE loads, Semi converter, Three phase half wave and full wave controlled converter, Dual Converter, Performance Parameters, Effect of freewheeling diode and source inductance on performance of these rectifier circuits. Comparison of midpoint and bridge rectifier circuits.	Talks and presentations	12
3	Choppers Principle of Chopper Operation, Various control strategies in chopper, Step up & step down choppers, Pulse width modulation, Frequency modulation, Chopper configuration (Type A,B,C,D & E), Voltage commutated Chopper, Multi- Phase Choppers.	Talks and presentations	12
4	Inverters Principle of operation of voltage source inverter, Single-phase Bridge Inverter, Three-Phase Inverters-180 o and 120 o Conduction Mode, Voltage Control in Single Phase Inverters, Modulation Techniques, Forced commutated thyristors, Current source inverter, Series and parallel inverter, Inverter applications.	Brainstorming,Talks and presentations	13
5	AC Voltage Controllers and Cyclo-Converters Principle of On-Off Control and Phase Control, Single-Phase Voltage Controller for Resistive and Resistive-Inductive Load, Principle of Cyclo-Converter, Single-Phase to Single-Phase Step-Up and Step-Down Cyclo-Converter, Three-Phase to Single-Phase and Three-Phase to Three-Phase Cyclo- Converter.	Talks and presentations, Guided Questioning	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2	Implementation of rectifying circuit for mobile charging.	PBL	BL6-Create	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40		60	

Part E

Books	Rashid, M. H. (2011, January 1). Power Electronics: Circuits, Devices, and Application (for Anna University). Pearson Education India. http://books.google.ie/books?id=lfm1f57HVKcC&dq=Power+Electronics-Circuits,+Devices+and+Applications&hl=&cd=1&source=gbs_api Erickson, R. W., & Maksimović, D. (2020, July 14). Fundamentals of Power Electronics. Springer Nature. http://books.google.ie/books?id=nhrxDwAAQBAJ&printsec=frontcover&dq=power+electronics&hl=&cd=2&source=gbs_api
Articles	
References Books	1. Biswanath Paul: Industrial Electronics, PHI Learning. 2. T.E. Kissell: Industrial Electronics, PHI Learning. 3. P.C. Sen: Power Electronics. TMH Publisher. 4. Vedam Subramanyam: Power Electronics, New Age International.
MOOC Courses	1.Power Electronics By Prof. Bhuvaneshwari | IIT Delhi https://onlinecourses.nptel.ac.in/noc19_ee37/preview
Videos	1.https://www.youtube.com/watch?v=W7D8sYwVbUA 2.https://www.youtube.com/watch?v=ZbvWe9xBu3Q&list=PLp6ek2hDcoND7i5-DAD9mPmYF1Wg6ROdO

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	3	-	-	2	-	-	1	2	1
CO2	1	1	2	2	1	1	-	-	1	-	-	-	2	1	2
CO3	2	2	3	1	1	-	2	-	-	-	-	-	2	1	3
CO4	1	2	1	2	1	-	-	3	-	-	1	-	1	1	1
CO5	2	1	1	2	2	-	-	-	-	-	-	2	1	2	1
CO6	1	1	2	1	2	-	-	-	-	-	-	-	2	3	1

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Vehicle Dynamics
Course Code	EEL0637

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the behavior of vehicle systems and subsystems, tires, drive train, gear boxes **(BL2-Understand)** **CO2-** Use analysis and techniques learned in solid modeling and basic dynamics to develop computer models of linkages and complete working assemblies in two and three dimensions.**(BL3-Apply)** **CO3-** Understand vehicle dynamics for use in design and performance of ground vehicles**(BL2-Understand)** **CO4-** Transform solid models into dynamic models of vehicles for analysis of kinematics, (velocities and accelerations), kinetics (forces and moments).**(BL3-Apply)** **CO5-** Vehicle parts and assemblies under impulsive impact forces and collisions. Simulations using dynamic Finite Element Analysis under dynamic loads**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction, fundamental principles. vehicle tires performance, cornering characteristics Mechanics of Vehicle Terrain interaction. Introduction to Vehicle Design using SOLIDWORKS	Talks and presentations	12
2	Vehicle Kinematics. Fundamental principles of velocity, acceleration. Two dimensional mechanisms. Forward Vehicle Dynamics Multi-Body Systems Design. Three dimensional Dynamics. Mechanics of Vehicle Terrain interaction	Talks and presentations	13
3	Kinetics and Applied mechanisms. Forces and Moments in mechanisms. Application of fundamental laws of motion, energy and momentum to the design of vehicle mechanisms.Vehicle vibrations principles. Seat Belt Design Mathematical Models. Drive train dynamics, vehicle performance	Talks and presentations	11
4	Steering Mechanisms. Two and three-dimensional analysis. Mechanics of Vehicle Terrain interaction. Vehicle Collisions. Fundamental laws of motion, energy and momentum Forces and Moments 2D and 3D	Talks and presentations	12
5	The Dynamics of vehicle rollovers. NHTSA Computer Finite Element Modeling (FEA) and failure analysis Handling Characteristics of Road Vehicles Simulation Tests	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Signal & Systems
Course Code	EEM0610

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** to understand Time and frequency domain analysis of systems**()** **CO2-** to learn Laplace-Transform (LT) and Z-transform (ZT)**()** **CO3-** to learn Fourier Transforms (FT)**()** **CO4-** to understand different linear and nonlinear system**()** **CO5-** to understand different signals**()**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Signals: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/nonperiodic,even/odd,energy/power,deterministic/random,onedimensional/multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	Talks and presentations	12
2	Laplace-Transform (LT) and Z-transform (ZT):One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping.	Talks and presentations	13
3	Fourier Transforms (FT):Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT .Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.	Talks and presentations	11
4	Systems: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density.	Talks and presentations	12
5	Time and frequency domain analysis of systems : Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	Text Books: 1. P. Ramakrishna Rao, 'Signals and Systems' 2008 Ed., Tata McGraw Hill, New Delhi
Articles	
References Books	Reference Books: 1. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004 3. Hwei. P .Hsu, Signals and Systems, Schaum`s outlines, TMH.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	-	2	2	2
CO2	1	-	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	-	1	2	3	2
CO4	1	1	-	1	1	1	-	-	-	-	1	1	2	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	1	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Computer Aided Protection
Course Code	EEM0611

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Storage Systems, Operating systems, Networking and Database			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember microprocessor based protection system**(BL1-Remember)** **CO2-** To set up the digital protection systems for transformer, generator, transmission line and other devices**(BL2-Understand)** **CO3-** To analyze and select the particular digital components for a particular protection requirement**(BL3-Apply)** **CO4-** To evaluate the fault and tripping time of circuit in the fault case**(BL4-Analyze)** **CO5-** To create a business continuity plan**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Microprocessors Based Protective Relays, Over current, Impedance, Directional, reactance, MHO, off -set MHO relays, interface for distance relays, based on - line protection of Generator and Transformer.	Lectures with whiteboard/PPT, Recorded video/interactive videos	12
Unit 2	Digital Protection, Static relays using digital techniques, Digital relaying algorithm, on- line digital protection of three phase EHV/UHV transmission system. Digital protection of Generator, Transformer, Digital protection for parallel transmission line.	Lectures with whiteboard/PPT, Recorded video/interactive videos, lab	12
Unit 3	Recent Developments, Fuzzy set approach to fault type and its location, Neutral Network application to fault location, High Impedance fault detection techniques. Introduction to genetic algorithm.	Lectures with whiteboard/PPT, Recorded video/interactive videos, lab	12
Unit 4	Review of Electromagnetic Relay, Design, aspect of relay, coordination of relay setting , performance of relay i. e. speed , reliability & transient performance, testing of D / C & distance relays.	Lectures with whiteboard/PPT, Recorded video/interactive videos, lab	12
Unit 5	Static Relays. Protection, Comparators, amplitude and phase Comparators, phase splitting techniques, Vector product devices, multi input Comparators. Block diagram representation of static instantaneous, over current, inverse DTL, IDMTL O/C relays. Static protection schemes for line, Transformer and generator.	Lectures with whiteboard/PPT, Recorded video/interactive videos, lab	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Characteristics of solid state Over Voltage Relay.	Experiments	BL2-Understand	
1	To study the operation of a non-directional electro-mechanical type over current relay and hence to obtain its inverse time current characteristics.	Experiments	BL4-Analyze	
1	To Study the operation of static Under Voltage Relay	Experiments	BL4-Analyze	
1	To study the operation of Under Current Relay.	Experiments	BL4-Analyze	
1	To Study Three Phase ABCD Parameters as practical application in transmission lines	Experiments	BL4-Analyze	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Sunil S Rao Switchgear and protection Khanna Publishers , New Delhi Rabindranath and M Chander Switchgear and protection
Articles	
References Books	L.P.Singh, Digital Protection Wiley Eastern Ltd, Badri Ram & D.N. Vishwakarma, Power system Protectin & Switchgear TMH Publishing Company Ltd. New Delhi M.V. Deshpande Switchgear and Protection TMH Publishing Company Ltd. New Delhi
MOOC Courses	1.Digital Protection of Power System Electronics & Communication Engineering Prof. Bhaveshkumar R. Bhalja IIT Roorkee 2.Power System Protection Electrical Engineering Prof. Ashok Kumar Pradhan IIT Kharagpur 3.:Power System Protection and Switchgear Electrical Engineering Prof. Bhaveshkumar R. Bhalja IIT Roorkee
Videos	1.https://www.youtube.com/watch?v=NVglhdH6P4c 2.https://www.youtube.com/watch?v=_uoy5YV8C_8

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	-	-	-	-	1	1	3	2	2
CO2	1	1	-	1	1	1	-	-	-	1	1	-	3	3	2
CO3	1	1	1	-	1	1	-	-	-	-	1	1	3	2	3
CO4	1	1	1	-	1	1	-	-	-	-	1	1	3	3	2
CO5	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Special Electrical machine & Design
Course Code	EEM0612

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">3rd</td><td rowspan="2">Semester</td><td rowspan="2">6th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>5</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Major</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="4">To understand the contents and successfully complete this course, participant must have a basic understanding of AC Machines, DC Machines.</td><td>Co-Requisite/s</td><td colspan="3"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Classify & select proper material for the design of an electrical machine (BL1-Remember)
CO2- Design overall transformer(BL2-Understand)
CO3- Estimate the performance characteristics of Transformer with the constraints specified.(BL3-Apply)
CO4- Design Stator core & stator winding of an Induction motor. (BL4-Analyze)
CO5- Design rotor core & rotor winding of an induction motor & calculate load current & other performance characteristics
CO6- Design overall dimensions of synchronous machine & cooling of synchronous generator</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✓</td><td>SDG (Goals)</td><td colspan="4">SDG7(Affordable and clean energy)
SDG8(Decent work and economic growth)
SDG11(Sustainable cities and economies)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Design of Synchronous Machine Features of construction of low speed and medium speed Machine, design consideration of turbo and water wheel alternators, output coefficient and choice of main dimensions, design of stator winding, and design of field systems, regulation, losses and efficiency, cooling systems.	Talks and presentations	12
Unit-2	Design of 3 Phase Induction Motor: Design consideration of ac motors, calculation of main dimensions, design of stator winding, effect of air gap on performance. Rotor Design: Design of slip ring and squirrel cage rotor, components of leakage reactance, calculation of leakage reactance and its effect on the performance.	Talks and presentations, ,Brainstorming	11
Unit-3	Design of single phase Induction motor: Calculation of main dimensions of stator, complete design of stator with its punching details, design of main and auxiliary winding, design of rotor, performance calculation of designed rotor and performance by equivalent circuit approach.	Talks and presentations	13
Unit-4	Design of Electrical Equipments Design of choke, DC motor starter, Lifting magnets and other electromagnetic devices.	Talks and presentations, Case studies	10
Unit-5	Computer Aided Design: Philosophy and economics of computer aided design, advantages limitations, analysis and synthesis methods, and selection of input data and design variables, flow charts for design of induction motor and synchronous machine. Optimization of design constrained and unconstrained optimization problem.	Talks and presentations	14

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Design and construction analysis of 3-phase squirrel cage Induction machine.	Experiments	BL2-Understand	2
Experiment-2	Design and construction analysis of 3-phase slip ring Induction machine.	Experiments	BL2-Understand	
Experiment-3	TO STUDY 3 PHASE TRANSFORMER & AUTOTRANSFORMER	Experiments	BL2-Understand	
Experiment-4	Introduction to design of Dc shunt Machine.	Experiments	BL3-Apply	
Experiment-5	Elementary analysis and design of synchronous machine through cut section model .	Experiments	BL4-Analyze	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	Deshpandey M.V Design of Electrical Machines PHI Learning
Articles	
References Books	Veinot Cyril G Computer Aided Design of Electrical Machinery Veinot Cyril G Sharanugasundararn A., Gangadharan G., & Palani R. Electrical Machine Design Data Book Wiley Eastern Ltd., New Delhi
MOOC Courses	1.Optimisation for Machine Learning: Theory and Implementation (Hindi) Computer Science and Engineering Prof. Pravesh Biyani IIT Madras 2.Electrical Equipment and Machines: Finite Element Analysis Electrical Engineering Prof. Shrikrishna V. Kulkarni IIT Bombay 3.Electrical Machines Electrical Engineering Prof. G.Bhuvaneshwari IIT Delhi
Videos	1.https://www.youtube.com/watch?v=PGihCyWoVGE 2.https://www.youtube.com/watch?v=M-WOeclY9Vc 3.https://www.youtube.com/watch?v=UYRxK2huBOY 4.https://www.youtube.com/playlist?list=PL9s6YpaXIcJt1IeX3JV1z1j1E9JUi3bFj

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	-	-	-	1	-	-	-	-	-	-
CO2	1	1	-	-	-	2	-	-	-	1	-	-	-	-	-
CO3	1	-	2	1	1	-	3	-	-	-	1	-	-	-	1
CO4	1	1	1	-	-	-	-	4	1	-	-	-	-	4	-
CO5	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-
CO6	-	-	-	-	1	-	-	-	-	-	-	-	5	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electrical Engineering Simulation Lab -II
Course Code	EEP 0603

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	Design of lag, lead and lag-lead compensators.	Experiments	BL2-Understand	2
Experiment-2	Load flow studies.	Experiments	BL3-Apply	2
Experiment-3	Fault analysis.	Experiments	BL4-Analyze	2
Experiment-4	Transient stability studies.	Experiments	BL5-Evaluate	2
Experiment-5	Economic power scheduling	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Major project-I
Course Code	EED0704

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Utilize contemporary tool sets to simulate and verify utilizing experimental methods whenever possible.**(BL3-Apply)** **CO2-** . Verify and examine the outcomes by utilizing various case studies.**(BL4-Analyze)** **CO3-** Make logical deductions and draw significant conclusions that are suitable for publication.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electric drives
Course Code	EEL0718

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">7th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>Course Type</td><td colspan="8">Lab only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">To explain dynamics and modes of operation of electric drives. To explain selection of motor power ratings and control of dc motor using rectifiers To analyze the performance of induction motor drives under different conditions To explain the control of induction motor, synchronous motor and stepper motor drives.</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To explain dynamics and modes of operation of electric drives. To explain selection of motor power ratings and control of dc motor using rectifiers To analyze the performance of induction motor drives under different conditions To explain the control of induction motor, synchronous motor and stepper motor drives(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="2">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG7(Affordable and clean energy)
SDG9(Industry Innovation and Infrastructure)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment No.1	Speed control of Induction Motor by V/F Method	Experiments	BL3-Apply	2
Experiment No.2	Firing angle control of thyristor based dc drive connected to dc motor.	Experiments	BL5-Evaluate	2
Experiment No.3	Closed loop speed control of dc motor using PID Controller.	Experiments	BL3-Apply	2
Experiment No.4	Closed loop speed control of dc motor-generator set with load using PID controller.	Experiments	BL4-Analyze	2
Experiment No.5	Step speed response of second order dc motor system.	Experiments	BL5-Evaluate	2
Experiment No.6	Ramp speed response of second order dc motor system.	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Electric drives
Course Code	EEL0718

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Electives							
Pre-Requisite/s	basic understanding of electrical machines			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To define electric drive, its parts, advantages and explain choice of electric drive. **(BL1-Remember)** **CO2-** To explain dynamics and modes of operation of electric drives. **(BL2-Understand)** **CO3-** To explain selection of motor power ratings and control of dc motor using rectifiers. **(BL3-Apply)** **CO4-** To analyze the performance of induction motor drives under different conditions . **(BL4-Analyze)** **CO5-** To explain the control of induction motor, synchronous motor and stepper motor drives.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Basic Concepts of Electric Drives Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives. Motor Mechanism dynamics Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.	Talks and presentations	12
2	DC Drives Starting & Braking of conventional, Phase controlled and chopper-controlled drives, Transient & Steady state analysis, Energy recovery systems.	Talks and presentations, Solution-based learning	12
3	Induction Motor Drives Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo-converter fed drive, Vector control drives. Slip Controlled IM Drives Review of Conventional methods & converter controlled-Crammers & Scherbius drives; rotor impedance control.	Talks and presentations	11
4	Synchronous Motors Drives VSI and CSI fed; self-controlled-Brush less &. Commutator less dc & ac motor drives	Talks and presentations,Case studies	13
5	Special Drives: Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives. Case Studies Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.	Talks and presentations	11

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To explain dynamics and modes of operation of electric drives.	Experiments	BL3-Apply	2
II	To analyze the performance of induction motor drives under different conditions.	Experiments	BL4-Analyze	2
III	To explain the control of induction motor, synchronous motor and stepper motor drives.	Experiments	BL5-Evaluate	2
IV	To explain the control of induction motor, synchronous motor and stepper motor drives.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40		60	

Part E

Books	1 Dubey G. K., "Power Semiconductor Controlled Drives", PHI, 2 Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House. 3 P.V. Rao, "Power semiconductor Drives", BS Publications
Articles	
References Books	1. Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern. 2. Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon Press, Oxford University Press. 3. Ned Mohan Electrical Machine Drive WILEY INDIA. 4. Bose B. K., "Power Electronics and AC Drives", PHI Learning. 5. S.Shiva Nagaraju power semiconductor drive PHI learning
MOOC Courses	1.https://archive.nptel.ac.in/courses/108/104/108104140/ 2.Fundamentals of Electric Drives, Electrical Engineering, Prof. Shyama Prasad Das,IIT Kanpur 3.Advanced Electric Drives, Electrical Engineering, Dr. S.P. Das, IIT Kanpur
Videos	1.https://www.digimat.in/nptel/courses/video/108104140/L01.html 2.https://www.youtube.com/watch?v=QaLGo0R0SYU 3.https://www.youtube.com/watch?v=Ub-csHc4VhA 2.

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	3	-	-	2	-	-	1	2	1
CO2	1	1	2	2	1	1	-	-	1	-	-	-	2	1	2
CO3	2	2	3	1	1	-	2	-	-	-	-	-	2	1	3
CO4	1	2	1	1	1	-	-	3	-	-	1	-	1	1	1
CO5	2	1	1	2	2	-	-	-	-	-	-	2	1	2	1
CO6	1	1	2	1	1	-	-	-	-	-	-	-	2	3	1

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	High Voltage Engineering
Course Code	EEL0738

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge about electrical machines			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various aspects of high voltage engineering.**(BL1-Remember)** **CO2-** To understand Generation, Measurement and testing of high voltage.**(BL2-Understand)** **CO3-** To implement Flow charts and practice set to understand the subject.**(BL3-Apply)** **CO4-** To analyze the different numeric problems for well understand subjects problems. **(BL4-Analyze)** **CO5-** To evaluate and summarize the data using statistical & visualization tools.**(BL5-Evaluate)** **CO6-** To prepare the models based on of real world problems of high voltage. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Generation of high voltages: Different methods of generation of direct current voltages, alternating current voltages and Impulse High Voltage, voltage doubler circuits, voltage multiplier circuits, cascade transformers, resonant transformers, tesla coil, multistage impulse generator	white board	12
Unit-2	Measurement of high voltages: Different methods of measurement of direct current voltages, alternating current voltages and Impulse High Voltage, resistance potential dividers, generating voltmeters, series impedance voltmeters, series capacitance voltmeters, capacitance voltage transformer, electrostatic voltmeters, sphere gap method.	white board	12
Unit-3	High Voltage Testing: Power frequency tests and impulse tests on Insulators bushings, short circuit tests on isolators and circuit breakers, dielectric power factor test and partial discharge measurement on cables, impulse testing of transformers.	white board	12
Unit-4	Conduction and breakdown in vacuum, solid and liquid dielectrics: Concepts of electric stress, dielectric strength, breakdown in vacuum, liquids, solids, particle exchange mechanism, field emission theory, suspended particle theory, cavitation and bubble mechanism, stressed oil volume theory, solid dielectrics used in practice.	white board	12
Unit-5	Applications of Insulating Materials: Applications in power transformers, rotating machines, circuit breakers, cables, power capacitors, high voltage bushings, fractional horse power motors. Insulation coordination on high voltage power systems, surge arresters.	white board	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	M.S. Naidu High Voltage Engineering Tata McGraw Hill, New Delhi
Articles	
References Books	C.L. Wadhwa High Voltage Engineering New Age International Ltd. Publisher, New Delhi. Dr. M.P. Chourasia High Voltage Engineering Khanna Publisher Delhi. E. Kuffel & W.S. Zaengl High Voltage Engineering Newnes , New Delhi.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	3	-	-	1	-	-	-	1	-	-	-	-	-	-
CO3	-	-	2	-	-	-	3	-	-	1	-	-	2	-	-
CO4	-	-	-	1	-	-	-	4	-	-	2	-	-	1	-
CO5	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	SCADA systems and applications
Course Code	EEM0713

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">7th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Major</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Introduction to SCADA and PLC(BL2-Understand)
CO2- to learn on SCADA system components(BL2-Understand)
CO3- to learn on SCADA Architecture(BL2-Understand)
CO4- to learn on SCADA Communication methods(BL2-Understand)
CO5- to learn on Operations and controls of interconnected power system(BL3-Apply)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to SCADA and PLC: SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.	Talks and presentations	12
2	SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server	Talks and presentations	13
3	SCADA Architecture- Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.	Talks and presentations	11
4	SCADA Communication- Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.	Talks and presentations	12
5	Operation and control of interconnected power system- Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation, SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Stuart A Boyer: SCADA supervisory control and data acquisition.
Articles	
References Books	Reference Books: 2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols. 3. Sunil S. Rao, Switchgear and Protections, Khanna Publication
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Calibration and testing of electrical equipments
Course Code	EEM0714

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">7th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Electives</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3">Knowledge of Electrical measurements and measuring instruments</td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Measurement standards and its units(BL1-Remember)
CO2- Measurement methods and characteristics of measurements(BL2-Understand)
CO3- Calibration procedures and methods of calibration(BL3-Apply)
CO4- Installation and commissioning of indoor and outdoor equipment.(BL4-Analyze)
CO5- Testing of new & Old electrical installation as per IS (BL5-Evaluate)
CO6- To enable the students to think in terms of innovative ideas to improve the existing technology in the field of measurements in terms of accuracy, cost, durability and user friendliness(BL6-Create)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Electricity Rules: Indian Electricity Rules, Indian Electricity Act, Electricity Supply Act.	Talks and presentations	12
Unit-2	Standards: Study of Various Indian Standards codes for various important electrical equipments.	Talks and presentations	12
Unit-3	Installation & Commissioning : Installation & Commissioning of outdoor Indoor electrical equipments like transformer, Motors, Switchgears, Panels, Relays, CT, PT, Ear thing etc.	Talks and presentations, PBL	12
Unit-4	Testing: Testing of new & Old electrical installation as per IS of the following. Transformer, Cables, Insulating Oil, Protective relays, Circuit Breakers, CT, PT, Meters, Energy Meters, PVC insulated cables, High voltage Testing & Routing Test, Type test on above.	Talks and presentations, PBL. Case Study	12
Unit-5	Calibration : Calibration of meters, Energy meters, Relays, Circuit breakers, & other Equipments as per IS specification.	Talks and presentations, PBL	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	M. Subbarao Installation Commissioning & testing of Electrical Engineering Equipments Khanna Pub.
Articles	
References Books	Jagdishlal Handbook of Electricity Laws Nanak Bhavan NewDelhi. I.S. Codes Indian Standard codes, Indian Standard Institution Nanak Bhavan, NewDelhi
MOOC Courses	1.Electrical Machines -I, Electrical Engineering, Dr. D.Kastha, IIT Kharagpur 2.Electrical Machines I, Electrical Engineering, Prof. G. Sridhara Rao, IIT Madras
Videos	1.https://www.youtube.com/watch?v=Ex_K3kSPAx4 2.https://www.youtube.com/watch?v=gXviN1bXXP8

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	1	-	-	-	1	-	-	-	-
CO2	-	2	-	-	-	-	-	-	1	-	-	-	-	5	-
CO3	-	-	1	-	-	1	-	1	-	-	-	1	-	-	-
CO4	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power system reliability
Course Code	EEM0715

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">7th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Disciplinary Major</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- to learn on industrial utilization methods()
CO2- to learn design of distribution system()
CO3- to learn on power quality and its overview()
CO4- to learn on different maintenance systems()
CO5- to learn on ISO 9000 and TQM()</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4"></td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
1	Reliability of Engineering Systems Component reliability, Hazard models, Reliability of systems wit non-repairable components, series, Parallel, Series-Parallel, Parallel-series configurations. Non-series-parallel configurations, minimal tie-set, minimal cut-set and decomposition methods. Repairable systems, MARKOV process, Long term reliability, Power System reliability.	Talks and presentations	12
2	Reliability of Engineering Systems Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modeling, Cumulative load model, merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.	Talks and presentations	13
3	Power Network Reliability Weather effect on transmission lines, Common mode failures, Switching after faults, three, state components, Normally open paths, Distribution system reliability.	Talks and presentations	11
4	Composite System Reliability Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load Models, Cost and worth of reliability.	Talks and presentations	12
5	Reliability Improvement & Testing Proper Design simplicity, Component improvement Testing Plans, time censored & sequential reliability tests, accelerated life test, Environ mental test, Reliability estimations	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. M.V. Deshpande, “Electrical Power System Design” TMH, New Delhi 2. J.B. Gupta “Utilization of Electric Power & Electric Traction” Katson Publishing House 3. Math H.J. Bollen, “Understanding Power Quality Problems” IEEE Press,Standard Publishers & Distrubutior, Dehli
Articles	
References Books	4. P. Gopalkrishnan & A.K. Banergy, “Maintenance and Spare Parts Management” PHI 5. Dr. K.C. Arora “Total Quality Management” S.K. Katariay & Sons, New Delhi
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	-	2	3	2
CO4	1	1	-	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Energy Management & Audit
Course Code	EEM0716

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the basics of energy management, energy demand management and energy auditing**(BL1-Remember)** **CO2-** Understand the need and significance of energy audit and management and understand the concept of measuring instruments for energy auditing, defining, and examining the various characteristics of instruments.**(BL2-Understand)** **CO3-** To understand efficient heat & electricity utilization, saving and recovery in different thermal and electrical system.**(BL3-Apply)** **CO4-** Analyze energy consumption patterns and trends within an organization or system, evaluating the economic and environmental impacts of different energy management practices.**(BL4-Analyze)** **CO5-** Assess and compare various renewable energy technologies and their potential integration into existing energy systems, making informed recommendations based on feasibility and sustainability criteria.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✓ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	General energy problem: Energy use patterns and scope for conservation, Energy Scenario: Commercial and Non-commercial energy resources, Primary & secondary energy resources, Load forecasting,. Energy needs of growing economy, Thermodynamics of Energy Conservation Energy Conservation Act-2001 and its features.	Talks and presentations	12
Unit-2	Energy audit: Auditing and Targeting, Types of energy audit, Energy monitoring, Energy accounting and analysis, Energy conservation policy, Energy Auditing instruments, , Energy management system, Use of Artificial intelligence based techniques in EMS, Functions of energy managers.	Talks and presentations	13
Unit-3	Energy efficient electric drives, Energy efficient motors, Energy Conservation in transportation system especially in electric vehicle, Energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning qualities, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic).	Talks and presentations	11
Unit-4	Power factor improvement in power system Energy conservation by improvement of load factor, Energy conservation in different industries, e.g. Iron and Steel industry, Aluminum industry, Cement industry, Paper and Textile industry, Electrical Energy Conservation in building, heating and lighting and domestic gadgets.	Talks and presentations	10
Unit-5	Demand side management Load management, Energy costs and two-part tariff, Restructuring of electric tariff from energy conservation consideration, Energy storage and Co-Generation, Payback period, Energy economics, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, inflation risk analysis.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Power Generation, Operation & Control, A.J. Wood and B.F. Wolenberg, John Wiley & Sons Ltd. 2. Patterns of Energy Use in Developing Countries by Desai, Wiley Eastern Ltd.
Articles	
References Books	1. Electrical energy utilization and conservation -- S C Tripathi ,Tata McGraw Hills 2. Energy Conservation- Paul O Callagan- Pergamon Press
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	3	3	3	-	-	-	-	-	-	-
CO2	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO3	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO4	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO5	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power quality and industrial application
Course Code	EEM0717

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of power system and power electronics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various aspects of Power quality and industrial applications.**(BL1-Remember)** **CO2-** To understand Industrial utilization, Power quality and maintenance.**(BL2-Understand)** **CO3-** To implement Flow charts and practice set to understand the subject.**(BL3-Apply)** **CO4-** To analyze the different numeric problems for well understand subjects problems**(BL4-Analyze)** **CO5-** To evaluate and summarize the data using statistical & visualization tools.**(BL5-Evaluate)** **CO6-** To prepare the models based on of real world problems of power quality. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Industrial Utilization: Type of lighting scheme, Design of Lighting schemes, factory lighting, methods of lighting calculations, street lighting, flood lighting.	Talks and presentations	12
Unit-2	Design of Distribution Systems: Development of a distribution plan, primary distribution design, secondary distribution design, planning and design of town electrification scheme, design of industrial distribution systems.	Talks and presentations	12
Unit-3	Power Quality: Overview of Power quality, power quality & EMC standards, Overview of Reliability evaluation: Generation reliability, distribution reliability, Industrial Power Systems reliability.	Talks and presentations, field work	12
Unit-4	Maintenance: An overview , role of maintenance in failure , design of maintenance system, need for maintenance planning , benefits of maintenance planning . Predictive maintenance, non destructive testing and diagnostic instruments, Safety management: Safety principle and guidelines, computers in maintenance and maintenance budget.	Talks and presentations, PBL, Case studies	12
Unit-5	Introduction to ISO 9000 and TQM: History of Quality, Quality management, quality principles, total quality , total quality control, total quality management, ISO9000.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	M.V. Deshpande Electrical Power System Design TMH, New Delhi
Articles	
References Books	1. J.B. Gupta Utilization of Electric Power & Electric Traction Katson Publishing House Murphy M. D., and Tumbuli F Power Electronic Control of AC Motors Pergamon Press, Oxford University Press Math H.J. Bollen Understanding Power Quality Problems IEEE Press, Standard Publishers & Distributor, Delhi
MOOC Courses	1.Power Quality Electrical Engineering Prof. Bhim Singh IIT Delhi 2.Power Quality Improvement Technique Electrical Engineering Prof. Avik Bhattacharya IIT Roorkee 3.Power Quality in Power Distribution Systems Electrical Engineering Dr. Mahesh Kumar IIT Madras
Videos	https://www.youtube.com/watch?v=q4VjsHq4LOk https://www.youtube.com/watch?v=x_H3kqJR_YE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-
CO3	-	-	2	1	-	-	-	-	1	-	-	1	-	-	-
CO4	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	1	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Advanced power system protection
Course Code	EEM0718

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the various types of relays, comparators and their realization using static circuits.**(BL1-Remember)** **CO2-** Understand the realization of over current, distance and differential relays using comparators.**(BL2-Understand)** **CO3-** Realize the various dynamic characteristics of digital relays for protection of transmission lines, transformers**(BL3-Apply)** **CO4-** Analyze different Protection schemes of bus bar and transmission lines.**(BL4-Analyze)** **CO5-** Identify the new developments in Digital Protection.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Protective Relays: Relaying review, characteristics and operating equations of relays.CT's and PT's differential relay, over-current relay, reverse power relay, distance relays, applications of relays.	Talks and presentations	12
Unit-2	STATIC RELAYS: Introduction, advantages and disadvantages, classification logic ckts, smoothing circuits, voltage regulator square wave generator, time delay ckts level detectors, summation device, sampling circuit, zero crossing detector, output devices. COMPARATORS: Replica Impedance, mixing transformers, general equation of phase and amplitude comparator, realization of ohm, impedance and off set impedance characteristics, duality principle, static amplitude comparators, coincidence circuit, Hall effect devices, Magneto receptivity, zener diode phase comparator multi input comparators.	Talks and presentations	13
Unit-3	Generator and transformer protection: Protective devices for system. Protective devices for stator, rotor, and prime mover of generator, percentage differential relays protection, three winding transformer protection, earth fault protection, generator Transformer unit protection	Talks and presentations	11
Unit-4	Bus bar and transmission line protection: Distance protective schemes, directional wave detection relay. Phase compensation carrier protection. High impedance differential scheme, supervisory and check relay, Some features of 500 KV relaying protection.	Talks and presentations	10
Unit-5	Modern trends in power system protection: Different types of digital and computer aided relays, Microprocessor based relays, auto-reclosing, frequency relays, under and over frequency relays, di/dt relays. Algorithms for transmission line, transformer & bus bar protection; out-of-step relaying Introduction to adaptive relaying & wide area measurements	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Power System Protection and Switchgear, B.Ram – Tata Mc-Graw Hill Pub. 2. Switchgear and Protection, M.V.Deshpande - Tata Mc-Graw Hill Pub.
Articles	
References Books	1. Power System Protection & Switchgear, Ravindra Nath, M.Chander, Willy P 2.Computer Relaying for power system, Arun Phadke, James Thorp, Johns W P
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	-	3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-	3	3	-
CO5	2	-	3	-	-	-	-	-	-	-	-	-	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Machine Learning
Course Code	EEO0701

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of Linear Algebra and Statistics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of machine learning.**(BL1-Remember)** **CO2-** To understand the basic concepts of machine learning, various machine learning models, Performance Evaluation techniques and how to improve the performance of the Machine Learning models.**(BL2-Understand)** **CO3-** To implement various Machine Learning Models.**(BL3-Apply)** **CO4-** To train & test machine Learning Models. **CO5-** To evaluate the performance of Machine Learning Models.							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction: Learning systems, real world applications of machine learning, why machine learning, variable types and terminology, function approximation Types of machine learning: Supervised learning, unsupervised learning, reinforcement learning Important concepts of machine learning: Parametric vs non-parametric models, the trade-off between prediction accuracy and model interpretability, the curse of dimensionality, measuring the quality of fit, bias-variance trade off, overfitting, model selection, no free lunch theorem.	Lecture Method/Video Clips	12
II	Linear Regression: Linear regression, estimating the coefficients, accessing the accuracy of coefficient estimates, accessing the accuracy of the model, multiple linear regression, qualitative predictors Classification: Logistic regression, estimating regression coefficients, making predictions, multiple logistic regressions, linear discriminant analysis, Bayes' theorem of classification, LDA for p=1, LDA for p>1, quadratic discriminant analysis	Lecture Method/Video Clips/Simulation	10
III	Resampling Methods, Model Selection and Regularization: Cross- validation, leave-one-out crossvalidation, k-fold cross-validation, the bootstrap, subset selection, shrinkage methods, ridge and lasso regression, dimension reduction methods, principal components regression, partial least square. Tree Based Methods: Advantages and disadvantages of trees, regression Trees, classification trees, bagging, random forest, boosting.	Lecture Method/Video clip/Simulation	12
IV	Support Vector Machine: Maximum margin classifier, classification using a separating hyperplane, the maximal margin classifier, support vector classifier, support vector machines, classification with non-linear decision boundaries, support vector machine, one-versus-one classification, one-Versus many classification.	Lecture Method/Video Clips/Simulation	10
V	Unsupervised Learning and Reinforcement Learning: Principle component analysis, what are principal components, clustering methods, k- means clustering, hierarchical clustering, Independent component analysis, latent semantic indexing, Markov Models, Hidden Markov Models, Reinforcement Learning.	Lecture Method/Video	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Write a program to handle missing value for .csv file.	Experiments	BL5-Evaluate	2
1	Write a program to Pre-processing of data for.csv file.	Experiments	BL4-Analyze	2
2	Write a program to implement Logistics Algorithm for .csv file.	Experiments	BL5-Evaluate	2
3	Write a program to implement Decision Tree Algorithm for .csv file.	Experiments	BL5-Evaluate	2
5	Heart Disease Prediction	PBL	BL5-Evaluate	20
4	Brain Tumor Detection and Prediction System	PBL	BL5-Evaluate	6
4	Crop/Plant Disease Detection & Prediction System	PBL	BL6-Create	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Aurélien Géron Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems
Articles	B. D. Shivahare, S. Suman, S. S. N. Challapalli, P. Kaushik, A. D. Gupta and V. Bibhu, "Survey Paper: Comparative Study of Machine Learning Techniques and its Recent Applications," 2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM), Gautam Buddha Nagar, India, 2022, pp. 449-454, doi: 10.1109/ICIPTM54933.2022.9754206.
References Books	D. E. Goldberg Genetic Algorithms in Search, Optimization & Machine Learning Pearson
MOOC Courses	https://onlinecourses.nptel.ac.in/noc23_cs18/preview
Videos	https://www.youtube.com/watch?v=fC7V8QsPBec

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	3	-	-	-	-	-	-	2	-	1	2
CO3	1	-	1	-	1	-	-	-	-	-	-	-	-	2	2
CO4	2	2	-	-	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	2	-	-	-	-	-	-	1	-	-	-	1	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Fundamentals of IoT and Sensors
Course Code	EEO0702

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Sensors, Smart Sensors, & IoT. **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various sensors. **(BL2-Understand)** **CO3-** To apply that how to make Sensors by using different electronic components, apply an integrated knowledge on the Sensors, work with and interpret the data obtained from various sensor applications**(BL3-Apply)** **CO4-** To analyse various parameters of sensors using simulation or performing experiments on kits.**(BL4-Analyze)** **CO5-** Evaluate performance of sensors & actuators for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Sensors: Sensors, Transducers, Difference between Sensor & Transducer, Different criteria to choose a sensor. Classification of Sensors: analog sensors, digital sensors, scalar sensors, vectored sensors. Need of Sensors. Temperature Sensors: Thermocouple-measuring principle and its applications, Resistive temperature detectors (RTD): used materials and construction and its applications. Thermistors: Principle and application. Comparison among Thermistor, Thermocouple, & RTD.	Audio, Video clip/Group discussion/Research/Field visit	12
2	Different types of Sensors: PIR sensor, Ultrasonic sensor, Gas Sensors, Proximity Sensor, Rain sensor, Touch Sensor, IR Sensor, Humidity Sensor, Semiconductor Sensors: working principle and its applications. Optical Sensors: Photodiodes, Photoresistor, PIN diode, Position Sensitive photo detectors, Pressure sensors. Chemical sensors: Electrochemical sensor, Amperometric and voltammetric sensors, potentiometric sensor, Bio sensors and applications	LectureAudio, Video clip/Group discussion/Research/Field visit	12
3	Smart Sensors and Actuators: Architecture of sensor node, Components of Sensor, Participatory Sensing, Wireless sensor motes and its applications: Mica2/MicaZ Motes, TelosB Motes, XM1000 wireless mote, Indriya, IRIS, iSense, Preon32, Wasp Mote, WiSense Mote, panStamp NRG Mote . Actuators: Principle, Types and Examples of Actuators, Sensor Data Communication Protocols.	Audio, Video clip/Group discussion/Research/Field visit	12
4	Internet of things (IoT): An Overview: Basics, definition and vision of IOT, IoT Conceptual Framework, IoT Architectural View, Physical Design of IoT, Logical Design of IoT, Applications of IoT. RFID: features, working principle, and applications.	Audio, Video clip/Group discussion/Research/Field visit	10
5	IoT Practical Applications: Definition & Essentials of IoT & IoT applications for: Home, Cities, Environment, Energy Systems, Retail, Logistics, Industry, Agriculture, Health & Lifestyle.	Audio, Video clip/Group discussion/Research/Field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	IOT based Smart specs	PBL	BL6-Create	30
2	smart dustbin based on iot	PBL	BL6-Create	30
1	To familiarize with various sensors such as LM 35 Temperature Sensor, PIR Sensor, Soil Sensor, Thermistor Sensor.	Experiments	BL6-Create	2
1	To study characteristics of Platinum RTD (Resistance Temperature Detector) sensor	Experiments	BL6-Create	2
1	To study Characteristics of NTC Thermistor sensor.	Experiments	BL5-Evaluate	2
1	Study the Characteristics of K Type Thermocouple.	Experiments	BL6-Create	2
1	Study the characteristics of Pressure Transducer/ Sensor.	Experiments	BL6-Create	2
2	To make a touch sensor using 555 Timer IC on Breadboard	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	1) Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015 2) Shantanu Bhattacharya, A K Agarwal, Environmental, Chemical and Medical Sensors, Springer Nature Singapore Pvt. Ltd. 2018
Articles	10.1088/978-0-7503-2707-7ch1
References Books	1) Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black, McGraw Hill Publication Raj Kamal, Internet of Things, TMH, New Delhi.
MOOC Courses	https://courses.mooc.fi/org/uh-cs/courses/introduction-to-the-internet-of-things-mooc
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	1	1	2	2	1	2	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	1	-	3	3	3	2
CO4	1	2	2	3	2	-	-	2	-	-	2	1	3	2	2
CO5	-	-	-	-	1	2	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Soft computing Techniques
Course Code	EEO0703

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">7th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Electives</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Learn about soft computing techniques and their applications(BL1-Remember)
CO2- Analyze various neural network architectures(BL2-Understand)
CO3- Define the fuzzy systems (BL3-Apply)
CO4- Analyze the genetic algorithms and their applications. (BL4-Analyze)
CO5- Evaluate and integrate various soft computing techniques in order to solve problems effectively and efficiently.(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.	Talks and presentations	12
Unit-2	Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions. Radial basis function network, Kohonen self organizing feature map.	Talks and presentations	13
Unit-3	Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, fuzziness and probability theory. Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	Talks and presentations	11
Unit-4	Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	Talks and presentations	10
Unit-5	Various types of hybrid systems, Introduction to Particle Swarm Optimization and Ant Colony Optimization.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. S, Rajasekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications”, Prentice Hall of India Publication. 2. N.P.Padhy, “Artificial Intelligence and Intellegent Systems” Oxford University Press.
Articles	
References Books	1. S.N. Sivanandam & S.N. Deepa, “Principles of Soft Computing”, Wiley Publications 2. Rich E and Knight K, “Artificial Intelligence”, TMH, New Delhi. 3. Bose, “Neural Network fundamental with Graph” , Algo.& Appl, TMH 4. Kosko, “Neural Network & Fuzzy System”, PHI Publication
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	1	-	2	-	-	-	3	3	-
CO2	3	1	-	2	-	-	-	-	-	1	-	-	3	3	3
CO3	1	3	3	2	1	-	-	1	1	-	-	-	2	-	2
CO4	2	-	-	2	-	-	1	1	-	-	-	-	2	3	2
CO5	2	1	2	-	3	-	-	-	2	-	-	-	3	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Industrial training-III
Course Code	EET0704

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Participate in the projects in industries during his or her industrial training.**(BL2-Understand)** **CO2-** Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.**(BL4-Analyze)** **CO3-** Describe use of advanced tools and techniques encountered during industrial training and visit.**(BL4-Analyze)** **CO4-** Develop awareness about general workplace behavior and build interpersonal and team skills.**(BL5-Evaluate)** **CO5-** Prepare professional work reports and presentations.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Major Project
Course Code	EED0804

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Utilize contemporary tool sets to simulate and verify utilizing experimental methods whenever possible. **(BL3-Apply)** **CO2-** Verify and examine the outcomes by utilizing various case studies. **(BL5-Evaluate)** **CO3-** Make logical deductions and draw significant conclusions that are suitable for publication.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Home Automation System	PBL	BL6-Create	120
2	Arduino Radar Model	PBL	BL6-Create	120
3	DC motor speed control wireless	PBL	BL6-Create	120

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	1	1	3	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	2
CO3	1	1	1	1	-	-	-	-	-	-	1	1	2	2	2
CO4	1	1	1	1	1	-	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Utilization of electrical power
Course Code	EEL0822

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge about power system			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various aspects of utilization of power.**(BL1-Remember)** **CO2-** To understand illumination, heating, welding , electrolysis and traction system.**(BL2-Understand)** **CO3-** To implement Flow charts and practice set to understand the subject.**(BL3-Apply)** **CO4-** To analyze the different numeric problems for well understand subjects problems. **(BL4-Analyze)** **CO5-** To evaluate and summarize the data using statistical & visualization tools;**(BL5-Evaluate)** **CO6-** To prepare the models based on of real world problems utilization. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	ILLUMINATION ENGINEERING Nature of light, units, sensitivity of the eye, luminous efficiency, glares, Production of Light; Incandescent lamps, arc lamps gas discharge lamps, fluorescent lamps, polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.	white board	12
Unit-2	HEATING, WELDING AND ELECTROLYSIS I Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control, Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control.	white board	12
Unit-3	HEATING, WELDING AND ELECTROLYSIS II Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, electro-beam welding, and electrical equipment for them, Arc furnaces transformer and welding transformers, Review of electrolytic principles., laws of electrolysis, electroplating, anodizing electro cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.	white board	12
Unit-4	TRACTION Special features of Traction motors, Different system of electric traction and their Advantages and disadvantages, diesel electric locomotives, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion.	white board	12
Unit-5	TRACTION MOTORS DC motors, single phases and three phases motors, starting and control of traction motors, braking of traction motors: plugging, rheostat and regenerative braking, Modern 25KV a.c. single phase traction systems: advantages, equipment and layout of 25 KV, line and current selection, single phase power frequency a.c. traction.	white board	12

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
5	PLC based stepper motor for solar panel cleaning.	PBL	BL3-Apply	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Tailor, E.O. Utilization of Elect. Energy The Orient Blackswan
Articles	
References Books	H. Pratap Art and Science of Utilization of Electrical Energy Bhandari Benevolent & Educational Society Gupta, J.B. Utilization of Electrical Energy S.K. Kataria & Sons Garg, G.C., Utilization of Elect. Power and Elect. Traction Khanna Books
MOOC Courses	Lecture Series on Illumination Engineering by Prof. N.K. Kishore, Department of Electrical Engineering,IIT Kharagpur. For more details on NPTEL visit http://nptel.iitm.ac.in
Videos	1.https://www.youtube.com/watch?v=nMT7MzmG5ZA 2.https://www.youtube.com/watch?v=VnQ5fs1flJA

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	-	-	-	1	1	2	2	1
CO2	1	1	1	1	1	-	-	-	1	-	1	1	3	2	2
CO3	1	1	1	1	1	-	-	-	-	-	1	-	3	3	3
CO4	1	1	1	1	-	1	-	-	-	-	1	1	2	3	3
CO5	1	1	1	1	1	-	-	1	-	-	1	1	2	2	3
CO6	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Power system operation & Control
Course Code	EEL0839

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">8th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Embedded theory and lab</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Core</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Understand the concept of Optimal Power System Operation under various operating constraints. (BL1-Remember)
CO2- To know the importance of frequency control(BL2-Understand)
CO3- To analyze different methods to control reactive power(BL3-Apply)
CO4- To understand unit commitment problem and importance of economic load dispatch(BL4-Analyze)
CO5- To understand real time control of power systems (BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✓
Entrepreneurship ✕
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✓</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)
SDG8(Decent work and economic growth)
SDG9(Industry Innovation and Infrastructure)
SDG11(Sustainable cities and economies)
SDG12(Responsible consuption and production)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation – real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.	Talks and presentations	12
Unit-2	REAL POWER - FREQUENCY CONTROL - Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling – block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.	Talks and presentations	13
Unit-3	REACTIVE POWER – VOLTAGE CONTROL - Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.	Talks and presentations	11
Unit-4	ECONOMIC OPERATION OF POWER SYSTEM - Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem – solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.	Talks and presentations	14
Unit-5	COMPUTER CONTROL OF POWER SYSTEMS - Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem – measurements and errors - weighted least square estimation - various operating states - state transition diagram.	Talks and presentations	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	To study characteristics of solid state over voltage and under voltage relay	Experiments	BL2-Understand	2
Experiment 2	To study characteristics of static type over current relay	Experiments	BL2-Understand	2
Experiment 3	Under voltage relay static type	Experiments	BL3-Apply	2
Experiment 4	To study IDMT Over current relays single phase and to determine the pick up and reset value	Experiments	BL4-Analyze	2
Experiment 5	To study line to line fault	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Olle.I.Elgerd, ‘Electric Energy Systems theory - An introduction’, McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010. 2. Allen. J. Wood and Bruce F. Wollen berg, ‘Power Generation, Operation and Control’, John Wiley & Sons, Inc., 2016. 3. Abhijit Chakrabarti and Sunita Halder, ‘Power System Analysis Operation and Control’, PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.
Articles	
References Books	1. Kothari D.P. and Nagrath I.J., ‘Power System Engineering’, Tata McGraw-Hill Education, Second Edition, 2008. 2. Hadi Saadat, ‘Power System Analysis’, McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010. 3. Kundur P., ‘Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	3	-	-	-	-	3	3	2
CO2	3	2	2	-	-	-	-	-	-	1	-	-	2	3	-
CO3	1	3	1	2	1	-	1	-	1	-	1	-	2	2	3
CO4	2	1	1	-	-	3	-	1	-	-	1	-	2	1	-
CO5	2	3	3	2	1	-	-	-	-	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Distributed Generation System
Course Code	EEM0819

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Acquire the knowledge of evolution of smart grid, need of smart grid. Awareness about the national and the international policies undertaken in order to adopt smart grid concept worldwide.**(BL1-Remember)** **CO2-** Comprehend the acquaintance of intelligent electronic devices and their application in monitoring and protection. Understanding advantages and challenges of latest smart storage devices like SMES, pumped hydro storage and compressed air energy storage. Use of PMU and WAMS in modern power system analysis.**(BL2-Understand)** **CO3-** Understand the concept of real time pricing, automatic meter reading, outage management system. Identification of challenges and opportunities in advanced metering infrastructure and cyber security in smart grid.**(BL3-Apply)** **CO4-** Identification of power quality issues in grid connected renewable energy sources. Acquiring the knowledge of power quality conditioners and importance of power quality audit.**(BL4-Analyze)** **CO5-** Comprehend the acquaintance of micro grid and applications of micro grid. Understanding of thin solar films, variable speed wind generator, fuel cell and micro turbines in smart grid.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	DISTRIBUTED GENERATION: Energy Sources and their availability -trends in energy consumption, conventional and non-conventional energy sources – review of solar photovoltaic – wind energy systems – fuel cells, energy storage systems: batteries – ultra capacitors – fly wheels – captive power plants. Distributed generation – concept and topologies, renewable energy in distributed generation. IEEE 1547 Standard for interconnecting distributed generation to electric power systems – DG installations – siting and sizing of DGs – optimal placement – regulatory issues	Talks and presentations	12
Unit-2	ISSUES IN GRID INTEGRATION OF DISTRIBUTED ENERGY RESOURCES: Basic requirements of grid interconnections – operational parameters – voltage, frequency and THD limits – grid interfaces – inverter based DGs and rotary machines based DGs – reliability, stability and power quality issues on grid integration – impact of DGs on protective relaying and islanding issues in existing distribution grid.	Talks and presentations	13
Unit-3	MICROGRIDS: Introduction to microgrids – types – structure and configuration of microgrids – AC and DC micro-grids – power electronic interfaces for microgrids – energy management and protection control strategies of a micro-grid - case studies.	Talks and presentations	11
Unit-4	CONTROL OF MICROGRID: Modes of operation and control of microgrid: grid connected and islanded mode, active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques	Talks and presentations	10
Unit-5	OPERATION OF MICROGRID- Microgrid communication infrastructure, power quality issues in microgrids, regulatory standards, microgrid economics, and introduction to smart microgrids.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Essentials of Distributed Generation Systems,Gregory W. Massey, Jones & Bartlett Publishers. 2. Integration of Distributed Generation in the Power System Math H. Bollen, John Wiley & Sons
Articles	
References Books	3. Distributed Generation,N. Jenkins, Nicholas Jenkins, IET Press Rich E and Knight K, “Artificial Intelligence”, TMH, New Delhi. 4. Microgrids and Active Distribution Networks,S. Chowdhury, P. Crossley, IET Press. 5. Design of Smart Power Grid Renewable Energy Systems,Ali Keyhani, John Wiley & Sons
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	1	-	-	-	2	3	-
CO2	3	-	2	2	1	-	2	-	1	-	-	-	1	-	2
CO3	1	2	1	2	2	1	-	1	-	-	-	-	3	1	-
CO4	2	2	2	1	-	-	1	-	-	1	-	-	1	2	1
CO5	2	1	1	1	3	-	2	-	2	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Generalized Theory of Electrical Machines
Course Code	EEM0820

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Recall and describe the fundamental principles, operating mechanisms, and classifications of various electrical machines, including transformers, synchronous machines, and induction motors.**(BL1-Remember)** **CO2-** Explain the theoretical concepts behind the electromagnetic fields, torque production, and energy conversion processes in electrical machines.**(BL2-Understand)** **CO3-** Apply analytical techniques and mathematical models to solve problems related to the performance, efficiency, and control of electrical machines in practical applications.**(BL3-Apply)** **CO4-** Analyze the characteristics and performance parameters of different types of electrical machines under various loading and operating conditions, identifying factors affecting their efficiency and stability.**(BL4-Analyze)** **CO5-** Design and optimize electrical machine systems, integrating principles of machine theory, power electronics, and control strategies to meet specified industrial and commercial requirements.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Review : Primitive machine, voltage and torque equation. Concept of transformation changes of variables & m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine.	Talks and presentations	12
Unit-2	Induction Machine: Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1- ö induction motor & scharge motor.	Talks and presentations	13
Unit-3	Synchronous Machine : Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.	Talks and presentations	11
Unit-4	Operational Impedances and Time Constants of Synchronous Machines: Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactance, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.	Talks and presentations	10
Unit-5	Approximate Methods for Generator & System Analysis : The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. P.C.Krause, Analysis of Electric Machinery, Wiley India. 2. B.Adkins, The General theory of Electrical Machines.
Articles	
References Books	1 B.Adkins & R.G.Harley, The General theory of AC Machines. 2 P.S.Bhimbra, Generalised theory of Electrical m/c 3 White & Woodson, Electro Mechanical Energy Conversion.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	1	-	-	3	-	1	-	1	2	1	1
CO2	3	3	2	2	1	1	-	-	-	-	1	1	1	2	2
CO3	2	2	-	2	2	-	1	-	1	1	1	-	2	1	2
CO4	1	1	1	1	3	2	-	-	-	-	1	1	1	2	1
CO5	1	1	1	-	-	-	2	-	-	1	-	1	1	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	industrial instrumentation
Course Code	EEM0821

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic knowledge of Pressure, Sound, Flow, Temperature, Level, Humidity, Torque, Viscosity and Vibration measurements.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describes the purpose of instrumentation in Industrial processes. **(BL1-Remember)** **CO2-** Describes the working of RTD, Thermostats, and thermocouple.**(BL2-Understand)** **CO3-** Describes the Bourdon tube, diaphragms and Bell gauges for pressure measurement and to employ flapper-nozzle assembly for differential pressure measurement.**(BL3-Apply)** **CO4-** Describes the various flow and level measurement devices used for industrial purposes.**(BL4-Analyze)** **CO5-** Elucidate the construction and working of various industrial devices used to measure pressure, sound and flow**(BL5-Evaluate)** **CO6-** Illustrate measurement techniques for acceleration, vibration and density **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Review of different transducers, their characteristics, displacement, force, torque and speed measurement, measurement of different industrial processes, pressure measurement, flow measurement, temperature measurement.	Talks and presentations	12
Unit-2	Pressure measurement: Different type of manometers, diaphragm gauges, bellow and force balance type sensors, bourdern gauge, piezoelectric, capacitive and inductive pressure pickups, Vacuum pressure measurements: Mcleod gauge, pirani gauge, thermocouple gauge, knudsen gauge, ionization calibration procedures.	Talks and presentations	12
Unit-3	Flow measurement: Differential pressure flow meters, pitat tube, orifice, vanturi flow nozzle, hot wire flow meter, constant pressure drop, variable area meters (rotameter), turbine meters. Electromagnetic flow meters, ultrasonic flow meters, measurement of level, differiential pressure method, conductive and capacitive method, electrochemical method, use of radio scope for level measurement.	Talks and presentations, Cse study	12
Unit-4	Temperature measurements: Different types of temperature transducers, RTDS, industrial type RTD sensor, laboratory grade platinum temperature thermometer, thermo resistance thermometer, thermisters temperature detectors, digital quartz crystal thermometer	Talks and presentations, Problem-based learning	12
Unit-5	Displacement measurement: Linear variable displacement transducer, capacitive transducer. Force measurement: Hydraulic force meter, pneumatic force meter, electric force transducers, strain gauge load cell, inductor load cells.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	B.C. Nakra & K.K. Instrumentation Measurement and Analysis by B.C. Nakra & K.K. Chaudhary (VII Edition). Chaudhary (VII Edition), Tata McGraw Hill Publishing Ltd., New Delhi. 1. Electrical Measurement and Measuring Instruments by A K sawhney (VII Edition), Dhanpat Rai & Co. Tata McGraw Hill Publishing Ltd., New Delhi.
Articles	
References Books	A K sawhney Electrical Measurement and Measuring Instruments by A K sawhney (VII Edition), Dhanpat Rai D. Patranabis Principle of Industrial Instrumentation by Patranabis TMH , New Delhi. J.B. Gupta A Course in Electronic & Electrical Measurements & Instrumentation Kataria Sons
MOOC Courses	1.INSTART - Instrumentation Course https://www.udemy.com/course/instart-ic-training-course-chapter-1-basics/?couponCode=24T3MT53024 2.Instrumentation, Prof. Ashis Kumar Dutta, IIT Kharagpur
Videos	1.https://www.youtube.com/watch?v=7if7MSqiepg 2.https://www.youtube.com/watch?v=BOJqnvvWauE 3.https://www.youtube.com/watch?v=h8BlWgE8bH0

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	1	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	1	1	1	2	3	2
CO3	1	1	1	-	1	-	1	-	-	-	1	-	2	2	3
CO4	1	1	1	1	1	-	-	1	-	-	1	1	2	2	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	2	3	2
CO6	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	EHV AC and DC Transmission
Course Code	EEM0822

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concept and performance of EHV transmission line.**(BL1-Remember)** **CO2-** Acquire the knowledge about the properties of bundled conductors**(BL2-Understand)** **CO3-** Understand about the various conventional and advanced compensation devices. **(BL3-Apply)** **CO4-** Understand the concept of HVDC Transmission and about the various scheme of converter station, 12 – pulse converter, converter unit, converter operation, fitters, reactive power source, ground return and ground electrode.**(BL4-Analyze)** **CO5-** Understand the concept of how to control the HVDC link. Comparison between AC and DC transmissions Applications of HVDC transmission. Power modulation and power control of HVDC lines.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c.transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.	Talks and presentations	12
Unit-2	FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).	Talks and presentations	13
Unit-3	Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.	Talks and presentations	10
Unit-4	Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.	Talks and presentations	11
Unit-5	Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	S. Rao,- “EHV AC & DC Transmission” Khanna pub. 2. Kimbark,-” HVDC Transmission” john willy & sons pub. 3. Arrillaga,- “HVDC Transmission”2nd Edition ,IEE londan pub.
Articles	
References Books	4. Padiyar, -“HVDC Transmission” 1st Edition ,New age international pub. 5. T.K. Nagsarkar,M.S. Sukhiza, -“Power System Analysis”, Oxford University 6. Narain.G. Hingorani, l. Gyugyi-”Undustanding of FACTS concept and technology”, John Wiley & sons pub. 7.P.Kundur- “H.V.D.C. Transmission” McGraw Hill Pub.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	1	-	2	-	-	1	2	-
CO2	2	3	1	2	-	1	-	-	1	-	2	-	3	2	2
CO3	2	3	3	2	1	1	1	1	-	3	-	-	2	1	3
CO4	3	1	2	1	-	-	-	-	3	-	-	-	1	1	1
CO5	3	1	3	3	1	1	1	1	-	2	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	HVDC
Course Code	EEM0823

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">8th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Electives</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- To understand Generation of High Voltage(BL1-Remember)
CO2- To learn and understand High Voltage Measurement(BL2-Understand)
CO3- To know Industrial application of High Voltage Engineering(BL3-Apply)
CO4- Analyze the operational characteristics and performance of HVDC systems under various conditions, including fault scenarios, and propose solutions to mitigate potential issues.(BL4-Analyze)
CO5- To Evaluate High Voltage Test & Specifications(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✕
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✕
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)
SDG12(Responsible consuption and production)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Generation of High Voltage: Different methods of Generation of A.C., D.C., and Impulse High Voltage, Circuits for double exponential Impulse and switching surge Generation fast Switching, Analysis of Impulse waveform and Generator efficiency.	Talks and presentations	12
Unit-2	High Voltage Measurement: Review of Measurement methods, Electrostatic Voltmeter Compensated Dividers at power frequency, Divider for Impulse waveform, Divider at power frequency. Divider compensation critical High Voltage and current measurement, Optical signal links.	Talks and presentations	13
Unit-3	Industrial application of High Voltage Engineering: Electrostatic precipitator, spraying of liquid and power coating, Mineral Separation, Electrostatic Precipitation and printing Electrostatic hazards, Electron Microscope, X-ray Generation, Pulse power application, High power Electron beams for melting, welding etc, Application in space vehicles, Medical applications. Insulation Engineering.	Talks and presentations	12
Unit-4	Concepts of Electric stress, Dielectric Electric strength, Electric breakdown in vacuum, Gases, Liquids, Solids and dielectrics, testing in Solids, Insulation system in bushing, Transformers, Cables, Capacitors and Circuit breakers. Techniques of Electrical non-destructive evaluation of Material breakdown tests and measurement.	Talks and presentations	11
Unit-5	High Voltage Test & Specifications: Over voltage tests, Impulse test and routines interference test, Partial Discharge test, Test methods, Test on H.V.D.C. Equipment. High Voltage Switchgears: HVDC breakers, Harmonic Capacitors Switches, EHV Disconnecting switches, Corona and Corona losses, Earthing and Shielding of EHV System	Talks and presentations	13

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	High voltage Engineering by Dr. M.P. Chourasia Khanna Publisher Delhi. 2. High voltage Engineering by E. Kuffel & W.S. Zaengl, J. Kuffel, Newnes , New Delhi.
Articles	
References Books	High voltage Engineering by M.S. Naidu, V. Kamraju Tata McGraw Hill, New Delhi. 4. High voltage Engineering by C.L. Wadhwa, New Age International Ltd. Publisher ,New Delhi. 5. An Introduction to High Voltage Engineering by Subir Ray, Prentice Hall of India Pvt. Ltd.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	1	-	3	3	-	-	2	-	1	2	2
CO2	3	2	1	2	-	2	1	3	2	2	-	-	1	3	2
CO3	3	1	3	-	1	2	-	1	2	-	2	-	1	2	3
CO4	2	2	1	3	-	2	1	-	-	1	-	-	1	-	3
CO5	1	1	1	3	3	-	-	3	2	-	-	-	1	3	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

(SOET)(BTech-ElectricalEngineering)

Title of the Course	Smart Grid and Energy Management
Course Code	EEM0824

Part A

<table>
<tr><td rowspan="2">Year</td><td rowspan="2">4th</td><td rowspan="2">Semester</td><td rowspan="2">8th</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Course Type</td><td colspan="8">Theory only</td></tr>
<tr><td>Course Category</td><td colspan="8">Discipline Electives</td></tr>
<tr><td>Pre-Requisite/s</td><td colspan="3"></td><td>Co-Requisite/s</td><td colspan="4"></td></tr>
<tr><td>Course Outcomes & Bloom's Level</td><td colspan="8">CO1- Understand the fundamental principles, methodologies, and practices in energy management.(BL1-Remember)
CO2- Conduct comprehensive energy audits to identify energy-saving opportunities and strategies.(BL2-Understand)
CO3- Evaluate and implement energy efficiency measures in residential, commercial, and industrial buildings.(BL3-Apply)
CO4- Explore and analyze sustainable energy solutions and their impact on energy management practices.(BL4-Analyze)
CO5- Develop and implement effective energy management systems tailored for different facilities.(BL5-Evaluate)</td></tr>
<tr><td>Coures Elements</td><td colspan="3">Skill Development ✕
Entrepreneurship ✓
Employability ✓
Professional Ethics ✕
Gender ✓
Human Values ✕
Environment ✕</td><td>SDG (Goals)</td><td colspan="4">SDG4(Quality education)
SDG7(Affordable and clean energy)
SDG8(Decent work and economic growth)
SDG9(Industry Innovation and Infrastructure)</td></tr>
</table>

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction to Smart Grid: Evolution of electric grid, Definitions, Need for smart grid, Smart grid drivers, Functions of smart grid, Opportunities and barriers of smart grid, Difference between conventional grid and smart grid, Concept of resilient and self-healing grid. Components and architecture, Inter-operability, Impacts of smart grid on system reliability, Present development and international policies in smart grid, Smart grid standards.	Talks and presentations	12
Unit-2	Information and Communication Technology in Smart Grid: Wired and wireless communication -radio mesh, ZIGBEE, 3G, 4G and 5G. Digital PLC, DSL, Wi-Max, LAN, NAN, HAN, Wi-Fi, Bluetooth, Bluetooth Low Energy (BLE), Li-Fi. Communication Protocols in Smart grid, Introduction to IEC 61850 standard and benefits, IEC Generic Object-Oriented Substation Event - GOOSE, Substation model.	Talks and presentations	13
Unit-3	Smart grid Technologies Part I: Introduction to smart meters, Electricity tariff, Real Time Pricing- Automatic Meter Reading (AMR) - System, Services and Functions, Components of AMR Systems, Advanced Metering Infrastructure (AMI). Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid (V2G), Grid to Vehicle (G2V), Smart Sensors, Smart energy efficient end use devices, Home & Building Automation. Intelligent Electronic Devices (IED) and their application for monitoring & protection: Digital Fault Recorder (DFR), Digital Protective Relay (DPR), Circuit Breaker Monitor (CBM), Phasor Measurement Unit (PMU), Standards for PMU. Time synchronization techniques, Wide Area Monitoring System (WAMS), control and protection systems (Architecture, components of WAMS, and applications: Voltage stability assessment, frequency stability assessment, power oscillation assessment, communication needs of WAMS, remedial action scheme).	Talks and presentations	11
Unit-4	Smart grid Technologies Part II: Smart substations, Substation automation, Feeder automation, Fault detection, Isolation, and Service Restoration (FDISR), Geographic Information System (GIS), Outage Management System (OMS). Introduction to Smart distributed energy resources and their grid integration, Smart inverters, Concepts of microgrid, Need and application of microgrid – Energy Management- Role of technology in demand response- Demand side management, Demand side Ancillary Services, Dynamic line rating.	Talks and presentations	10
Unit-5	Cloud computing in smart grid: Private, Public and hybrid cloud. Types of cloud	Talks and presentations	14

	computing services- Software as a Service (SaaS), Platform as a service (PaaS), Infrastructure as a service (IaaS), Data as a service (DaaS), Cloud architecture for smart grid. Cyber Security - Cyber security challenges and solutions in smart grid, Cyber security risk assessment, Security index computation. Power Quality Management in Smart Grid- Fundamentals, Power Quality (PQ) & Electromagnetic Compatibility (EMC) in smart grid, Power quality conditioners for smart grid. Case study of smart grid.		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Stuart Borlase “Smart Grid Infrastructure Technology and Solutions”, CRC Press; 2nd edition. 2. James Momoh, “Smart Grid: Fundamentals of Design and Analysis”, Wiley, 2012. 3. S. Chowdhury, “Microgrids and Active Distribution Networks.” Institution of Engineering and Technology, 2009.
Articles	
References Books	4. Janaka Ekanayake, Kythira Liyanage, Jianzhong Wu, Akihiko Yokohama, Nick Jenkins- “Smart Grids Technology and Applications”, Wiley, 2012. 5. Clark W.Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press. 6. Jean Claude Sabonnadière, Nouredine Hadjsaïd, “Smart Grids”, Wiley Blackwell.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	-	1	3	-	1	-	-	1	-	1
CO2	3	1	2	2	-	1	1	-	-	1	-	-	1	1	1
CO3	2	1	3	2	1	1	2	1	1	-	-	-	-	1	1
CO4	2	1	2	1	-	1	3	-	1	1	-	-	1	1	1
CO5	1	1	1	2	1	-	1	1	-	-	-	-	1	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-