















## Syllabus-2023-2024

### BTech-ElectricalEngineering

<b>Title of the Course</b>	Essentials of Information Technology
<b>Course Code</b>	CSL0201

#### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					2	0	2	4
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Foundation core							
<b>Pre-Requisite/s</b>	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.				<b>Co-Requisite/s</b>			
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)( <b>BL1-Remember</b> ) <b>CO2-</b> Apply the various networking concepts, topologies and remove deadlocks. (Apply). ( <b>BL2-Understand</b> ) <b>CO3-</b> Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)( <b>BL3-Apply</b> ) <b>CO4-</b> Design the concept of software, operating system for better utilization of external system (Design)( <b>BL4-Analyze</b> ) <b>CO5-</b> Evaluating the various algorithm, its solution and other communication techniques. (Investigation). ( <b>BL5-Evaluate</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values X Environment X			<b>SDG (Goals)</b>		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,T7), 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

<b>Books</b>	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.
<b>Articles</b>	
<b>References Books</b>	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
<b>MOOC Courses</b>	
<b>Videos</b>	





## Syllabus-2023-2024

### BTech-Electronics\_and\_Communication

<b>Title of the Course</b>	Essentials of Information Technology
<b>Course Code</b>	CSL0201[T]

#### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					2	0	2	4
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Foundation core							
<b>Pre-Requisite/s</b>	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.				<b>Co-Requisite/s</b>			
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)( <b>BL1-Remember</b> ) <b>CO2-</b> Apply the various networking concepts, topologies and remove deadlocks. (Apply). ( <b>BL2-Understand</b> ) <b>CO3-</b> Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)( <b>BL3-Apply</b> ) <b>CO4-</b> Design the concept of software, operating system for better utilization of external system (Design)( <b>BL4-Analyze</b> ) <b>CO5-</b> Evaluating the various algorithm, its solution and other communication techniques. (Investigation). ( <b>BL5-Evaluate</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values X Environment X			<b>SDG (Goals)</b>		SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)		

#### 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,T7), 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	50	60	30	40	0

#### Part E

<b>Books</b>	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.
<b>Articles</b>	
<b>References Books</b>	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
<b>MOOC Courses</b>	
<b>Videos</b>	



## Syllabus-2023-2024

### BTech-ComputerScience

<b>Title of the Course</b>	Software Engineering
<b>Course Code</b>	CSL0303[T]

#### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	0	0	3
<b>Course Type</b>	Theory only							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	student must have knowledge about basic data structures , computer organization & programming language concepts.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Understand the basics of software engineering like characteristic, crisis of software and process of software engineering systems (Knowledge, Understand)( <b>BL2-Understand</b> ) <b>CO2-</b> Apply the various SDLC, ER, DFD models, to collect SRS, And understand the software. (Apply).( <b>BL3-Apply</b> ) <b>CO3-</b> Design the Design Strategies, Architectural Design concept for better development of software (Design).( <b>BL6-Create</b> ) <b>CO4-</b> Explain various testing techniques and Analyze the concept of testing strategies (Analysis)( <b>BL4-Analyze</b> ) <b>CO5-</b> Evaluating the need of Software Maintenance and Software Project Management Software, Need for Maintenance, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering and other inter process communication tech An Overview of CASE Tools, Constructive Cost Models (COCOMO), Software Risk Analysis and Management. (Investigation).( <b>BL5-Evaluate</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values ✓ Environment X		<b>SDG (Goals)</b>		SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)			

#### Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	Lecturing	6
Unit-2	Planning: Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, Software Quality Assurance (SQA); Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Model.	Case Study	6
Unit-3	Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies; Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Function Point (FP) Based Measures, Cyclomatic Complexity.	Case Study	6
Unit-4	Testing: Software Testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	Case Study	6
Unit-5	Maintenance: Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management, An Overview of CASE Tools, Constructive Cost Models (COCOMO), Software Risk Analysis and Management.	Lecturing	6

#### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2,3,4	Case study	Case Study	BL5-Evaluate	15

#### 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	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	0	40	12	60	18

#### Part E

<b>Books</b>	Pressman, R. S., & Dr. B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. <a href="http://books.google.ie/books?id=i8NmnAEACAAJ&amp;dq=R.+S.+Pressman&amp;hl=&amp;cd=1&amp;source=gbs_api">http://books.google.ie/books?id=i8NmnAEACAAJ&amp;dq=R.+S.+Pressman&amp;hl=&amp;cd=1&amp;source=gbs_api</a> (Pressman & Dr, 2014)
<b>Articles</b>	
<b>References Books</b>	Pressman, R. S., & Dr. B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. <a href="http://books.google.ie/books?id=i8NmnAEACAAJ&amp;dq=R.+S.+Pressman&amp;hl=&amp;cd=1&amp;source=gbs_api">http://books.google.ie/books?id=i8NmnAEACAAJ&amp;dq=R.+S.+Pressman&amp;hl=&amp;cd=1&amp;source=gbs_api</a> (Pressman & Dr, 2014)
<b>MOOC Courses</b>	
<b>Videos</b>	<a href="https://onlinecourses.nptel.ac.in/noc20_cs68/preview">https://onlinecourses.nptel.ac.in/noc20_cs68/preview</a>

Course Articulation Matrix

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

## Syllabus-2023-2024

### BTech-ComputerScience

<b>Title of the Course</b>	Artificial Intelligence
<b>Course Code</b>	CSL0501[T]

#### Part A

Year	3rd	Semester	5th	Credits	L	T	P	C
					3	0	1	4
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	To understand the contents and successfully complete this course, a participant must have a basic understanding of Statistical Data Analysis and visualization methods, and Python Programming.				<b>Co-Requisite/s</b>			
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1- Remember(BL1-Remember)</b> <b>CO2- understand(BL2-Understand)</b> <b>CO3- Analyze(BL4-Analyze)</b> <b>CO4- Evaluate(BL5-Evaluate)</b> <b>CO5- Create(BL6-Create)</b>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values X Environment X			<b>SDG (Goals)</b>		SDG1(No poverty) SDG2(Zero hunger) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)		

#### Part B

Modules	Contents	Pedagogy	Hours
Unit-1:	Introduction to AI What is AI, Turing test, cognitive modelling approach, law of thoughts, the relational agent approach, the underlying assumptions about intelligence, techniques required to solve AI problems, level of details required to model human intelligence, successfully building an intelligent problem, history of AI	Lecturing	9
Unit 2 :	AI Systems and Techniques: Reasoning agents, Logic and inference via Logic Programming, Linked data, semantic net and internet search, planning under uncertainty, Adversarial search, game playing, Probabilistic inference, Natural language processing, approaches to machine translation.	Lecturing	9
Unit 3 :	AI Research Trends: Research trends in machine learning, deep learning, reinforcement learning, robotics, computer vision, natural language processing, collaborative systems, algorithmic game theory, internet of things (IoT), neuromorphic computing, Applications of AI by domain: Transportation, home/service robots, healthcare, education, lower source communities, public safety and security, employment and workplace, entertainment, finance, baking and insurance.	Case Study	9
Unit 4	Role of Artificial Intelligence in Society: Societal challenges AI presents, Ethical and Societal implications, policy and law for AI, fostering dialogue, sharing of best practices. Malicious Use of AI: Prevention and Mitigation: Security relevant properties of AI, Security domains and scenarios: digital security, physical security, pollical security, factors affecting the equilibrium of AI and security Explainable AI: Introduction to explainable AI, why explainable AI, interpretability and explain ability, methods of interpretability and explain ability.	Case Study	9
Unit 5	Introduction to Data Analytics: Working with Formula and Functions, Introduction to Charts, Logical functions using Excel, Analyzing Data with Excel.	Lecturing PBL	9

#### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit - I-V	PBL	PBL	BL6-Create	10
Unit -III - IV	Case Study	Case Study	BL4-Analyze	10
Unit II & V	Implement search algorithm of AI Develop an intelligent game using python Design a intelligent lock using python Elementary programs using LISP. Write a program to predict sales trends . Elementary program using prolog Write a program to design a NLP base user interface. Write a program to convert text to voice vice – versa. Apply and create formulas on excel sheet. Analyze the data using excel Visualize data in Excel using various types of charts.	Experiments	BL3-Apply	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	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

#### Part E

<b>Books</b>	Patterson, D. W. (1990, January 1). Introduction to Artificial Intelligence and Expert Systems.
<b>Articles</b>	
<b>References Books</b>	Rich, E., & Knight, K. (1991, January 1). Artificial Intelligence. McGraw-Hill Science, Engineering & Mathematics.
<b>MOOC Courses</b>	
<b>Videos</b>	



















## Syllabus-2023-2024

### BTech-ElectricalEngineering

<b>Title of the Course</b>	Power system operation & Control
<b>Course Code</b>	EEL0839

#### Part A

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

#### 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

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#### 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

<b>Books</b>	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.
<b>Articles</b>	
<b>References Books</b>	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.
<b>MOOC Courses</b>	
<b>Videos</b>	













## Syllabus-2023-2024

### BTech-ElectricalEngineering

<b>Title of the Course</b>	Smart Grid and Energy Management
<b>Course Code</b>	EEM0824

#### Part A

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

#### 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 (FDIR), 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 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.	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

<b>Books</b>	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.
<b>Articles</b>	
<b>References Books</b>	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 Hadjsaid, "Smart Grids", Wiley Blackwell.
<b>MOOC Courses</b>	
<b>Videos</b>	



























































