ate: 07/07/2024

INSTRUCTIONAL SYSTEM DESIGN

Class: **B. Tech (Auto)**

Course code & Course Title: **EED431 Power System Operation and Control**

Course Outcomes:

- CO1: Explain the fundamental concept of reactive power and illustrate various methods of reactive power compensation.
- CO2: Analyze the stability of power system using swing equation and equal area criteria.
- CO3: Explain excitation System, types and illustrate the control and protective functions of it.
- CO4: Discuss the Load frequency control mechanism of single area and two area system.
- CO5: Calculate the distribution of load between two power plants and comment on the method of load dispatching for economic operation of such plants.
- CO6: Discuss FACTS technology to improve AC transmission system performance

Locate COs in Revised Bloom-Vincenti Taxonomy Table

CO1: Explain the fundamental concept of reactive power and illustrate various methods of reactive power compensation. (Remember)

- Action: Explain, Illustrate
- Knowledge: Fundamental Concept, Reactive Power, Methods, Reactive Power Compensation
- Condition: None
- Criterion: None

CO2: Analyze the stability of power system using swing equation and equal area criteria.

- Action: Analyze
- Knowledge: Stability, Power System, Swing Equation, Equal Area Criteria
- Condition: None
- Criterion: None

CO3: Explain excitation System, types and illustrate the control and protective functions of it.

- Action: Explain, Illustrate
- Knowledge: Excitation System, Types, Control Functions, Protective Functions
- Condition: None
- Criterion: None

CO4: Discuss the Load frequency control mechanism of single area and two area system.

- Action: Discuss
- Knowledge: Load Frequency Control, Single Area System, Two Area System
- Condition: None
- Criterion: None

CO5: Calculate the distribution of load between two power plants and comment on the method of load dispatching for economic operation of such plants.

- Action: Calculate, Comment
- Knowledge: Load Distribution, Power Plants, Load Dispatching, Economic Operation
- Condition: None
- Criterion: None

CO6: Discuss FACTS technology to improve AC transmission system performance

- Action: Discuss
- Knowledge: FACTS Technology, AC Transmission System, Performance Improvement
- Condition: None (not explicitly mentioned)
- Criterion: None (not explicitly mentioned)

CO	Action	Knowledge	Condition	Criteria
1	**Explain**	Remembering(F)	None	None
2	**Analyze**	Analyze(C)	None	None
3	**Explain**	Comprehension (C, F)	None	None
4	**Discuss**	Comprehension (F, C & P)	None	None
5	**Calculate**	Analyze (F, C & P)	None	None
6	**Discuss**	Comprehension (F, C & P)	None	None

Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Explain	CO1							
Analyze		CO2						
Explain	CO3	CO3						
Discuss	CO4	CO4	CO4					
Calculate	CO5	CO5	CO5					
Discuss	CO6	CO6	CO6					

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories (KC), number of Class/ Laboratory/ Field sessions, and present it in the table format indicated with sample course.

Departmental PSO:

PSO 1: Inculcate the ability to utilize applied sciences, transform methods, discrete mathematics, applied differential equations and numerical methods in support of electrical and electronics engineering.

PSO 2: Demonstrate the ability to analyze, design & implement control and instrumentation systems with computer and power systems.

PSO 3: Student should be able to use computational techniques to design and analyze electrical systems.

Power system operation and control - Credits: 3:0:0

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs.)**
CO1	Explain the fundamental concept of reactive power and Illustrate various methods of reactive power compensation.	PO1, PSO3	R	F	06	00
CO2	Analyse the stability of power system using swing equation and equal area criteria.	PO1, PO2 PSO1 and 2	U	C	06	00
CO3	Explain excitation System, types and Illustrate the control and protective functions of it.	PO1 ,7 and 12 PSO2	AP	F,C	06	00
CO4	Discuss the Load frequency control mechanism of single area and two area system.	PO1, 4 PSO2	An	F, C, & P	06	00
CO5	Calculate the distribution of load between two power plants and comment on the method of load	PO1,2,4 PSO2	An	F, C, & P	06	00

	dispatching for economic operation of such plants.					
CO6	Discuss FACTS technology to improve AC transmission system performance	PO1, 2 PSO2	C	F, C, & P	06	00
Total Hours of instruction					**36**	**00**

Cognitive levels

R-Remember, U-Understand, AP- Apply, An-Analyse, E-Evaluate and C-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental Design Principles, C&S-Criteria and Specifications, PS- Practical Constraints, DI- Design Instrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

- Example (Showing only non-zero mapping entries):

CO	PO 1	PO 2	PO 3	PO 4	PO7	PO 12	PSO1	PSO2	PSO3
CO1	2				2	1			1
CO2	2	2					1	1	
CO3	2				1	1		1	
CO4	1			1				1	
CO5	2	1		2				1	
CO6	2	2					1		
Average	2	1.6							
Mapping Strength	2	2							

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

Cos	Assessment Items/Assessment Instruments		Delivery Technologies	Instruction types
CO1	MSE - I	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO2	MSE-I	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO3	MSE -II	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO4	MSE-II	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO5	Teacher Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO6	Continuous Internal Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan

Shital M. Mule
Course Teacher

Class: Final Year B.Tech(EE)(Autonomous)

Course: EED433 Electric Hybrid Vehicle

Step 1: Write Course Outcomes using Revised Bloom's Taxonomy

Structure of a CO statement

CO 1: Demonstrate the basic concepts of Conventional, Electric, Hybrid EV and state the impact of of conventional vehicles on the society (Analyze)

CO 2: Demonstrate different configurations of electric and hybrid electric drive trains with power flow (Understand)

CO 3: Discuss the propulsion unit for electric and hybrid vehicles (Understand)

CO 4: Demonstrate BLDC drive systems and various communication protocols for EV (Understand)

CO 5: Compare various energy storage and EV charging systems(Understand)

CO6: Demonstrate the breaking system for EV and EHV(Understand)

CO1: Demonstrate the basic concepts of Conventional, Electric, Hybrid EV and state the impact of conventional vehicles on the society

Action: Demonstrate

- *Knowledge: basic concept of EV with impact of EV and EhV on environment and society* (Conceptual, Fatuall)
- *Condition: electric ,hybrid electric vehivle*

CO2: Demonstrate different configurations of electric and hybrid electric drive trains with power flow

Action: Demonstrate

- *Knowledge:* different configuration (Conceptual, Procedural)
- *Condition:* EV and EHV
- *Criteria: with power flow*

CO3: Discuss the propulsion unit for electric and hybrid vehicles

Action: Demonstrate

- *Knowledge:* propulsion unit (Conceptual, Procedural)
- *Condition:* electric and hybrid vehicles

CO 4: Demonstrate BLDC drive systems and various communication protocols for EV

Action: Describe

- *Knowledge:* BLDC drive systems *(*Conceptual)
- *Condition:* various communication protocols for EV(, Procedural)
-

CO 5: Compare various energy storage and EV charging systems

Action: Demonstrate

- *Knowledge:* operation of single phase and three phase inverter*(*Conceptual, Procedural)
- *Condition: types of single phase inverterand mode of three phase Inverter*

CO6: Demonstrate the breaking system for EV and EHV

Action: Illustrate

- *Knowledge:* **energy storage**
- *Condition: Types of Energy storage (*Conceptual, Procedural)

Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	Knowledge Categories							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember	CO1							
Understand	CO1	CO1						
Analyze		CO3,CO4, CO5,CO6	CO3,CO4, CO5,CO6					
Evaluate								
Create								

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories(KC),numberofClass/Laboratory/Fieldsessions,andpresentitinthetableformat indicated with sample course Kinematics of Machines - Credits: 3:1:0

Departmental PSO:

PSO 1 : Inculcate the ability to utilize applied sciences, transform methods, discrete mathematics, applied differential equations and numerical methods in support of electrical and electronics engineering.

PSO 2 : Demonstrate the ability to analyze, design & implement control and instrumentation systems with computer and power systems.

PSO 3 : Student should be able to use computational techniques to design and analyze electrical systems.

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs)**
CO1	Demonstrate the basic concepts of Conventional, Electric, Hybrid EV and state the impact of of conventional vehicles on the society and different types of drive train topologies	PO1,PO2	An	F	6	-
CO2	Demonstrate different configurations of electric and hybrid electric drive trains with power flow	PO1, ,PO12	U	CP	6	-
CO3	Discuss the propulsion unit for electric and hybrid vehicles	PO1, PO12	U	CP	6	-
CO4	Demonstrate BLDC drive systems and various communication protocols for EV	PO2, PO12	U	CP	6	
CO5	Compare various energy storage and EV charging systems	PO2, ,PO12	U	CP	6	
CO6	Demonstrate the breaking system for EV and EHV	PO1,PO12	U	CP	6	
Total Hours of instruction					**36**	**00**

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate andC-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental DesignPrinciples, C&S-Criteria andSpecifications, PS- PracticalConstraints, DI-DesignInstrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

- Example (Showing only non-zero mapping entries):

CO	PO1	PO2	PO3	PO4	PO5	PO9	PO 12	PSO1	PSO2
CO1	3	3					1	1	1
CO2	3						1		1
CO3	3						1		1
CO4	3						1		1
CO5	3						1		1
CO6	3						1		1
Average	3						1	1	1
Mapping Strength	3						1	1	1

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

CO	PO1	PO2	PO3	PO4	PO5	PO9	PO 12
CO1	MSE-I					1	Quiz
CO2	MSE-I						1
CO3	MSE-II						1
CO4	MSE-II						1
CO5	TA						1
CO6	CIE						1
Average	3						1
Mapping Strength	3					1	1

Prof. S.A. Sabnis **Dr. S.M.Badave**

Course Coordinator **HEED**

COURSE NAME-Switchgear and Protection

COURSE CO-ORDINATOR-Prof. G.D Karanjgaokar

Course Outcomes-

Sr. No.	Level	Statement
CO 1	Understand	Summarize the need of protection systems and protective zones and basic terminologies pertaining to relays.
CO 2	Analyze	Explain the relaying principles of numerical relays used for differential relays, directional relays, impedance relays, admittance relays
CO 3	Analyze	Explain the construction , working and application of Oil circuit breakers, SF6 Circuit breakers and vacuum circuit breakers and HRC fuses.
CO 4	Apply	Identify appropriate protection scheme for transmission lines.
CO 5	Apply	Select appropriate protection scheme for transformers and alternators
CO 6	Understand	Demonstrate the basic principles and applications of current transformers and voltage transformers.

CO1- Summarize the need of protection systems and protective zones and basic terminologies pertaining to relays

- *Action:* -Summarize **(**Remember*),*
- *Knowledge:* need of protection systems and protective zones and terminologies
- *Condition:* pertaining to relays
- *Criteria:* Basic

CO2 Explain the relaying principles of numerical relays used for differential relays, directional relays, impedance relays, admittance relays.

- *Action:* Explain **(remember, apply, Analyze)**
- *Knowledge:* relaying principles of numerical relays *(Conceptual and Procedural)*
- *Criterion:* used for differential relays, directional relays, impedance relays, admittance relays

CO3- Explain the construction , working and application of Oil circuit breakers, SF6 Circuit breakers and vacuum circuit breakers and HRC Fuses

- *Action: Explain*
- *Knowledge:* construction , working and application

- *Criterion:* Oil circuit breakers, SF6 Circuit breakers and vacuum circuit breakers and HRC Fuses

CO-4- Identify appropriate protection scheme for transmission lines

- *Action: -* **Identify** *(Remember, Apply),*
- *Knowledge:* appropriate protection scheme
- *Criteria:* transmission lines

CO-5- Select appropriate protection scheme for transformers and alternators

- *Action: -* **Select** *(Remember, Apply),*
- *Knowledge:* appropriate protection scheme
- *Criteria:* transformers and alternators

CO-6- Demonstrate the basic principles and applications of current transformers and voltage transformers

- *Action: - Demonstrate (Remember, Apply),*
- *Knowledge:* basic principles and applications
- *Criteria:* current transformers and voltage transformers

- Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember		CO 1 CO2	CO1, CO5, CO6		CO 3, CO 4			
Understand		CO1	CO2					
Apply		CO2	CO2, CO5,					

			CO6					
Analyze		CO 2			CO3			
Evaluate								
Create								

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories(KC),numberofClass/Laboratory/Fieldsessions,andpresentitinthetableformat indicated with sample course Kinematics of Machines - Credits: 3:1:0

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs)**
CO1	Summarize the need of protection systems and protective zones and basic terminologies pertaining to relays.	PO1, PSO1	U	C,P	6	00
CO2	Explain the relaying principles of numerical relays used for differential relays, directional relays, impedance relays, admittance relays	PO2, PSO2	R	U,C, P	6	
CO3	Explain the construction , working and application of Oil circuit breakers, SF6 Circuit breakers and vacuum circuit breakers and HRC fuses.	PO1, PSO1	An	C,P	6	
CO 4	Identify appropriate protection scheme for transmission lines.	PO4, PSO3	Ap	FDP, C&S	6	
CO 5	Select appropriate protection scheme for transformers and alternators	PO 4 PSO3	Ap		6	
CO 6	Demonstrate the basic principles and applications of current transformers and voltage transformers.	PO 1 PSO1	U		6	
Total Hours of instruction					**36**	

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate andC-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental DesignPrinciples, C&S-Criteria andSpecifications, PS- PracticalConstraints, DI-DesignInstrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

COs	PO1	PO2	PO3	PO4	PO12	PSO1	PSO2	PSO3
CO1	3				1	1		
CO2		1			1		1	
CO3	3				1	1		
CO4				1	1			1
CO5				1	1			1
CO6	3				1	1		
Mapping	3	1		1	1	1	1	1

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

CO	PO1	PO2	PO3	PO4	PO11	PO 12	PSO1
CO1	MSE 1						
CO2		MSE 1					
CO3	MSE 2						
CO4				TA			
CO5				CIE 1			
CO6	CIE 2						

Course: Testing & Maintenance Course code: EED438 Class: Final Year (EE)

Step 1: Write Course Outcomes using Revised Bloom's Taxonomy

Structure of a CO statement

- **Action:** Represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).
- **Knowledge:** Represents the specific knowledge from any one or more of the eight knowledge categories
- **Condition:** Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)
- **Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)

CO1	Explain different types of testing, methods of testing and maintenance etc
CO2	Understand comprehensive testing techniques of electrical equipment's .
CO3	Explain troubleshooting and maintenance of household appliances
CO4	Gain knowledge of analysis tools and their response
CO5	Classify substation and explain substation layout study , earthing in detail
CO6	To perform different testing methods like megger testing, resistance testing, turns ratio test

Step 2: Locate COs in Revised Bloom-Vincenti Taxonomy Table

Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Metacognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember	CO2	CO1,	CO3					
Understand	CO2	CO1,CO 2,CO4 CO5	CO3, CO6				CO6	
Apply								

Analyze		CO3,	CO3					
Evaluate								
Create								

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories (KC), number of Class/ Laboratory/ Field sessions, and present it in the table format indicated with sample course.

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs)**
CO1	Explain different types of testing, methods of testing and maintenance etc	PO1,PSO 1, PSO2	R, U	C	6	00
CO2	Understand comprehensive testing techniques of electrical equipment's	PO2,PSO 1, PSO2	R, U	F, C	6	00
CO3	Explain troubleshooting and maintenance of household appliances	PO2,PSO 1, PSO2	An	C, P	6	00
CO4	Gain knowledge of analysis tools and their response	PO1,PSO 1, PSO2	U	C	6	00
CO5	Classify substation and explain substation layout study , earthing in detail	PO6,PSO 1,PSO2	U	U	6	00
CO6	To perform different testing methods like megger testing, resistance testing, turns ratio test	PO1,PSO 1, PSO2	U	P, C	6	00
Total Hours of instruction					36	00

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental Design Principles, C&S-Criteria and Specifications, PS- Practical Constraints, DI- Design Instrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

Example (Showing only non-zero mapping entries):

CO	PO1	PO2	PO3	PO5	PO6	PO11	PO12	PSO1	PSO2
CO1	2							2	2
CO2		2						2	2
CO3		2						2	2
CO4	2							2	2
CO5					2			2	2
CO6	2							2	2
Average	2	2			2			2	2
Mapping Strength	2.0	2.0			2			2.0	2.0

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

Cos	Assessment Items/Assessment Instruments		Delivery Technologies	Instruction types
CO1	MSE-I, CIE-I	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO2	MSE-I	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO3	MSE-II, TA	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO4	MSE-II	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO5	CIE-II	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO6	CIE-II	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan

Prof. Priya Gulbhile
Course Teacher

Course- Battery Management System

Step 1: Write Course Outcomes using Revised Bloom's Taxonomy

Structure of a CO statement

- **Action:** Represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).
- **Knowledge:** Represents the specific knowledge from any one or more of the eight knowledge categories
- **Condition:** Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)
- **Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)
- CO1: **Define** the parameters of BMS (Remember)
- CO2: **Explain** the terms used in BMS (Understand)
- CO3: **Describe** the BMS requirement (Apply)
- CO4: **Use** of algorithm for BMS (Apply)

Step 2: Locate COs in Revised Bloom-Vincenti Taxonomy Table

Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember	CO1							
Understand		CO2						
Apply	CO3	CO3	CO3					
	CO4	CO4						

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories (KC), number of Class/ Laboratory/ Field sessions, and present it in the table format indicated with sample course.

Battery Management System - Credits: 3:0:0

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs)**
CO1	**Define** the parameters of BMS (Remember)	PO1, PO12,PSO1	R	F	04	00
CO2	**Explain** the terms used in BMS (Understand)	PO1,PO6,PO12, PSO1	U	C	09	00
CO3	**Describe** the BMS requirement (Apply)	PO1,PPO6,PO7,O2,PO3, PSO1	Ap	F,C, P	07	00
CO4	**Use** of algorithm for BMS (Apply)	PO1,PO2,PO5, PSO3	Ap	F,C, P	02	00
Total Hours of instruction					**36**	**00**

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental Design Principles, C&S-Criteria and Specifications, PS- Practical Constraints, DI- Design Instrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

- Example (Showing only non-zero mapping entries):

CO	PO 1	PO 2	PO 3	PO 5	PO 6	PO 7	PO 12	PSO1	PSO2	PSO3
CO1	2						2	1		
CO2	2				1		1	1		
CO3	2	2	2		2	1		1		
CO4	2	1		2						1
Average	2	1.5	2	2	1.5	1	1.5	3		1
Mapping Strength	2	1.5	2	2	1.5	1	1.5	3		1

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

Cos	Assessment Items/Assessment Instruments		Delivery Technologies	Instruction types
CO1	MID Sem Exam-1/ Comprehensive Viva Voce/ MID Sem Exam-2/Teacher Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO2	MID Sem Exam-1/ Comprehensive Viva Voce / MID Sem Exam-2/ Teacher Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO3	MID Sem Exam-1/ Say Something / ABCD Whisper /MID Sem Exam-2/ Continuous Internal Evaluation	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO4	MID Sem Exam-1/ Say Something / ABCD Whisper/ MID Sem Exam-2/ Continuous Internal Evaluation	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan

Course- Energy Conservation and Audit

Step 1: Write Course Outcomes using Revised Bloom's Taxonomy

Structure of a CO statement

- **Action:** Represents a cognitive/ affective/ psychomotor activity the learner should perform. An action is indicated by an action verb, occasionally two, representing the concerned cognitive process(es).
- **Knowledge:** Represents the specific knowledge from any one or more of the eight knowledge categories
- **Condition:** Represents the process the learner is expected to follow or the condition under which to perform the action (This is an optional element of CO)
- **Criteria:** Represent the parameters that characterize the acceptability levels of performing the action (This is an optional element of CO)
- CO1: **Define** the terms for energy conservation (Remember)
- CO2: **Describe** the Methodology in audit (Understand)
- CO3: **Explain** Energy Efficiency in various Electrical Systems (Understand)
- CO4: **Illustrate** the terms used in Energy Economics (Apply)

- **Step 2**: Locate COs in Revised Bloom-Vincenti Taxonomy Table

Locating Sample CO in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember	CO1							
Understand		CO2						
			CO3					
Apply	CO4	CO4						

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories (KC), number of Class/ Laboratory/ Field sessions, and present it in the table format indicated with sample course.

Energy Conservation and Audit- Credits: 3:0:0

	Course Outcome	**POs/ PSOs**	**CL**	**KC**	**Class Sessions**	**Tutorial (Hrs)**
CO1	Define the terms for energy conservation (Remember)	PO1, PO3,PO6,PO7,PSO1	R	F	04	00
CO2	Describe the Methodology in audit (Understand)	PO2,PO12, PSO2	U	C	08	00
CO3	Explain Energy Efficiency in various Electrical Systems (Understand)	PO1,PO3,PO6,PO7, PSO1	U	C	06	00
CO4	Illustrate the terms used in Energy Economics (Apply)	PO1,PO2,PO4,PO5, PSO1	Ap	F,C, P	04	00
Total Hours of instruction					**36**	**00**

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental Design Principles, C&S-Criteria and Specifications, PS- Practical Constraints, DI- Design Instrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

- Example (Showing only non-zero mapping entries):

CO	PO 1	PO 2	PO 3	PO 4	PO 6	PO 7	PSO1	PSO2	PSO3
CO1	2		2		2	2	1		
CO2		2						1	
CO3	2		2		2	2	1		
CO4	2	2		2			2		
Average	2	2	2	2	2	2	1.3	1	
Mapping Strength	2	2	2	2	2	2	1.3	1	

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

Cos	Assessment Items/Assessment Instruments		Delivery Technologies	Instruction types
CO1	MID Sem Exam-1/ Quiz/ MID Sem Exam-2/Teacher Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO2	MID Sem Exam-1/ Quiz/ ABCD Whisper /MID Sem Exam-2/ Teacher Assessment	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO3	MID Sem Exam-1/ Say Something /MID Sem Exam-2/ Continuous Internal Evaluation	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan
CO4	MID Sem Exam-1/ ABCD Whisper/ Say Something /MID Sem Exam-2/ Continuous Internal Evaluation	ESE	Chalk & Board PPT Presentation Video Lecture	Teaching Plan

Instructional System Design

Course Coordinator: Dr. A. S. Borole

Course Name: Photovoltaic System Design (OE V)

Class: Final Year B.Tech-EE (Autonomous) 2024-25 **Semester:** VII

Step 1: Write Course Outcomes using Revised Bloom's Taxonomy

Structure of a CO statement

CO1: Understand the basics of sources of energy

CO2: Justify the most adequate PV system architecture based on the specific requirements

CO3: Analyse the effect of atmospheric conditions on solar panels.

CO4: Calculate the energy received from Sun at various conditions.

CO5: Understand the basics of Battery and its sizing for PV.

CO6: Develop the MPPT Algorithms for grid interfacing.

Step 2: Locate COs in Revised Bloom-Vincenti Taxonomy Table

Cognitive Processes	**Knowledge Categories**							
	Factual	Conceptual	Procedural	Meta-cognitive	Fundamental Design Principles	Criteria & Specifications	Practical Constraints	Design instrumentalities
Remember		CO5	CO3					
Understand	CO1, CO5		CO6					
Apply			CO4					
Analyze	CO3	CO2						
Evaluate		CO2, CO4						
Create			CO6					

Step 3: Tag course outcomes with Program Outcomes (POs,) Program Specific Outcomes (PSOs,) Cognitive Level (CL), Knowledge Categories (KC), number of Class/ Laboratory/ Field sessions, and present it in the table format indicated with for course ;

Electrical Machines-I (BTEEC302) - Credits: 4:0:1

	Course Outcome	POs/ PSOs	CL	KC	Class Sessions	Tutorial (Hrs)
CO1	**CO1:** Understand the basics of sources of energy	PO1, 6,7, PSO1,2,3	An	F,C,P	6	00
CO2	**CO2:** Justify the most adequate PV system architecture based on the specific requirements	PO1,2,4,5,12 PSO1,2	An	C	6	00
CO3	**CO3:** Analyse the effect of atmospheric conditions on solar panels.	PO1,2,7,12 PSO1	U	C	6	00
CO4	**CO4:** Calculate the energy received from Sun at various conditions.	PO1,2,12 PSO1,3	A	F, C	6	00
CO5	**CO5:** Understand the basics of Battery and its sizing for PV.	PO1, 12 PSO1,2,3	A	F, C	6	00
CO6	**CO6:** Develop the MPPT Algorithms for grid interfacing	PO1, 3,5,12, PSO1	An	C	6	00
Total Hours of instruction					**36**	**00**

Cognitive levels

R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create.

Categories of Knowledge

General Categories

F- Factual, C- Conceptual, P- Procedural, M-Metacognitive

Categories specific to Engineering

FDP- Fundamental Design Principles, C&S-Criteria and Specifications, PS- Practical Constraints, DI- Design Instrumentalities

Step 4: Decide on Strength of CO-PO/PSO Mapping

Course Outcomes												
	Program Outcomes											
	Engineering Knowledge	Problem Analysis	Design/ Development of Solution	Conduct Investigation of complex problem	Modern Tool usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and team work	Communication	Project Management And inance	Life Long learning
CO1: Apply the knowledge of basic circuital law and analyze the circuit using Kirchhoff's law.	**2**					**1**	1					
CO2: Simplify the network using reduction techniques and Network simplification theorems.	**2**	**2**		**1**	1							1
CO3: Analyze circuits using graph theory.	**2**	**1**					1					1
CO4: Infer and evaluate transient response, Steady state response, network functions.	**2**	**2**										1
CO5: Apply the Laplace transform to linear circuits and systems.	**2**											
CO6: Evaluate two-port network parameters and synthesize one port network.	**2**		**3**		1							1

Step 5: Identify the Assessment Items/Assessment Instruments, Delivery Technologies and Instruction types.

Cos	Assessment Items/Assessment Instruments		Delivery Technologies	Instruction types
CO1	ISE-1, TA1	ESE	Chalk & Board, PPT Presentation Video Lecture	Teaching Plan
CO2	ISE-1, CIE1	ESE	Chalk & Board, PPT Presentation Video Lecture	Teaching Plan
CO3	ISE-2 CIE1	ESE	Chalk & Board, PPT Presentation Video Lecture	Teaching Plan
CO4	ISE-2 CIE1	ESE	Chalk & Board, PPT Presentation Video Lecture	Teaching Plan
CO5	CIE2	ESE	Chalk & Board, PPT Presentation	Teaching Plan

			Video Lecture	
CO6		ESE	Chalk & Board, PPT Presentation Video Lecture	Teaching Plan

Dr. A. S. Borole
Course Coordinator

Dr.S.M.Badave
HEED