Ref No:

Sri Krishna Institute of Technology, Bangalore

COURSE PLAN

Academic Year 2019-2020

Program:	B E – Electrical and Electronics Engineering
Semester :	8
Course Code:	15EE833
Course Title:	Integration of Distribution generation
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	40
Course Plan Author:	Vinutha S

Academic Evaluation and Monitoring Cell

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A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	EE
Semester:	8	Academic Year:	2019-2020
Course Title:	Integration of Distributed Generators	Course Code:	15EE833
Credit / L-T-P:	3/L	SEE Duration:	180 Minutes
Total Contact Hours:	40	SEE Marks:	80 Marks
CIA Marks:	20	Assignment	1 / Module
Course Plan Author:	Vinutha S	Sign ..	
Checked By:	HOD	Sign ..	
CO Targets	CIA Target :	SEE Target:	

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute.

Module	Content	Teaching Hours	Blooms Learning Levels
1	**Distributed Generation:** Introduction,Sources of Energy - Wind Power, Solar Power, Combined Heat-and-Power, Hydropower, Tidal Power, Wave Power, Geothermal Power, Thermal Power Plants.	8	Remember L1 Understand L2
2	**Distributed Generation (continued):** Interface with the Grid. **Power System Performance**: Impact of Distributed Generation on the Power System, Aims of the Power System, Hosting Capacity Approach, Power Quality, Voltage Quality and Design of Distributed Generation, Hosting Capacity Approach for Events, Increasing the Hosting Capacity. **Overloading and Losses**: Impact of Distributed Generation, Overloading: Radial Distribution Networks, Overloading: Redundancy and Meshed Operation, Losses	8 (2, 4,2)	Understand L2 Analyze L4
3	**Overloading and Losses(continued):**Increasing the Hosting Capacity. **Voltage Magnitude Variations:** Impact of Distributed Generation, Voltage Margin and Hosting Capacity, Design of Distribution Feeders, A Numerical Approach to Voltage Variations, Tap Changers with Line-Drop Compensation, Probabilistic Methods for Design of Distribution Feeders	8 (2, 6)	Apply L3, Analyze L4
4	**Voltage Magnitude Variations (continued):** Statistical Approach to Hosting Capacity, Increasing the Hosting Capacity. **Power Quality Disturbances:** Impact of Distributed Generation, Fast Voltage Fluctuations, Voltage Unbalance.	8 (4,4)	Analyze L4 Analyze L4
5	**Power Quality Disturbances (continued):**Low-Frequency Harmonics, High-Frequency Distortion, Voltage Dips, Increasing the Hosting Capacity.	8	Analyze L4 Analyze L4
-	**Total**	**40**	

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).
1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2, 3, 4, 5	Integration of Distributed Generation in the Power System,Math Bollen,Wiley 2011	1,2,3,4,5	In Lib
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	https://www.youtube.com/watch?v=ptiaNGkuylY-52 min https://www.youtube.com/watch?v=_iz8ZkjD7z8-45 min		
C2	https://www.youtube.com/watch?v=UeaTgT2p-WI&list=PLRWKj4sFG7-6gWwDMLI0Wy5DDRqyKP1uQ-30 min https://www.youtube.com/watch?v=hB-WU3Axd0A-5 min		
C3	https://www.youtube.com/watch?v=9qovnvdiS7c – 6 min https://www.youtube.com/watch?v=RwuunGlzm_Y-8 min		
C4	https://www.youtube.com/watch?v=Y7_zKCnGgsI- 15min https://www.youtube.com/watch?v=opocYkK_oSA – 46		
C5	https://www.youtube.com/watch?v=uPtCTnDFhPQ-60 min https://www.youtube.com/watch?v=BbNCohM_mgo-3 min		
D	**Software Tools for Design**	**-**	**-**
	Distribution system- https://www.youtube.com/watch?v=YL-mfzDgpvI		
E	**Recent Developments for Research**	**-**	**-**
	Distribution generation-https://ieeexplore.ieee.org/document/8617795		
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**
1	https://www.dg.history.vt.edu/ch1/introduction.html		

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	15EE42	Power generation and economics	Power generation	4	-	L3
3	15EE62	Power system analysis	Representation of power system	5	-	L3

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1	Wind Power, Solar Power, Combined Heat-and-Power, Hydro power, Tidal Power, Wave Power, Geothermal Power, Thermal Power Plants.	Renewable energy resources	workshop on RES	Understand L2

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Instr Method	Assessment Method	Blooms' Level
1	15EE833.1	Analyze and explain the Electric Energy generation by renewable energy sources such as solar, wind and to choose locations to install them.	8	Lecture / PPT	Assignment and CIA	L3
2	15EE833.2	Explain the impact of distributed generation on power system-overloading and losses.	8	Lecture / PPT	Assignment and CIA	L4
3	15EE833.3	Explain the impact of distributed generation on voltage magnitude variations of the power system.	8	Lecture / PPT	Assignment and CIA	L4
4	15EE833.4	Explain the impact of distributed generation on Power quality disturbances of the power system.	8	Lecture / PPT	Assignment and CIA	L2
5	15EE833.5	Explain the effects of integration of distributed generation on power system stability and reliability.	8	Lecture / PPT	Assignment and CIA	L2
-	**-**		**40**	**-**		**L2-L4**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Standby or emergency power Niche application, green power	CO1	L2
2	co-genration Emergency power system	CO2	L2
3	Resource dynamics cooperation consulting services	CO3	L3

	Uninterrupted power supply		
4	Transmission and distribution Deferal Peak shaving	CO4	L3
5	Demand response Reserves	CO5	L4

3. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes														-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	CO1	Analyze and explain the Electric Energy generation by renewable energy sources such as solar, wind and to choose locations to install them.	2	2				2	2						2			
2	CO2	Explain the impact of distributed generation on power system-overloading and losses.	2	2	2										2			
3	CO3	Explain the impact of distributed generation on voltage magnitude variations of the power system.	3	3	2										3			
4	CO4	Explain the impact of distributed generation on Power quality disturbances of the power system.	2	3														
5	CO5	Explain the effects of integration of distributed generation on power system stability and reliability.	3	2											2			
-	**15EE662.**	Average																**-**
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; PSO 1: Apply fundamental knowledge to identify, formulate, design and investigate various problems of electrical and electronic circuits, power electronics, and power systems. PSO 2: Use latest Electrical and Electronics related software for simple design, drafting, manufacturing, maintenance and documentation of Electrical and Electronics components.PSO 3: Manage the Electrical process by selection and scheduling right type of machinery, Conductors, Electrical equipment, power quality control techniques, operational parameters and software for a particular power transmission process to achieve reliability and economical operation.*																

4. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

1					
2					

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA -1	CIA -2	CIA -3	Asg	Extra Asg	SEE		
1	Distributed Generation: Introduction, Sources of Energy - Wind Power, Solar Power, Combined Heat-and-Power, Hydro power, Tidal Power, Wave Power, Geothermal Power, Thermal Power Plants	8	2	-	-	1	0	2	CO1	L2
2	Distributed Generation (continued): Interface with the Grid. Power System Performance: Impact of Distributed Generation on the Power System, Aims of the Power System, Hosting Capacity Approach, Power Quality, Voltage Quality and Design of Distributed Generation, Hosting Capacity Approach for Events, Increasing the Hosting Capacity. Overloading and Losses: Impact of Distributed Generation, Overloading: Radial Distribution Networks, Overloading: Redundancy and Meshed Operation, Losses	8	2	-	-	1	0	2	CO2	L2
3	Overloading and Losses(continued):Increasing the Hosting Capacity. Voltage Magnitude Variations: Impact of Distributed Generation, Voltage Margin and Hosting Capacity, Design of Distribution Feeders, A Numerical Approach to Voltage Variations, Tap Changers with Line-Drop Compensation, Probabilistic Methods for Design of Distribution Feeders	8	-	2	-	1	0	2	CO3	L3
4	Voltage Magnitude Variations (continued): Statistical Approach to Hosting Capacity, Increasing the Hosting Capacity. Power Quality Disturbances: Impact of Distributed Generation,	8	-	2	-	1	0	2	CO4	L3

	Fast Voltage Fluctuations, Voltage Unbalance									
5	Power Quality Disturbances (continued):Low-Frequency Harmonics, High-Frequency Distortion, Voltage Dips, Increasing the Hosting Capacity	8	-	-	4	1	0	2	CO5	L4
-	**Total**	**40**	**4**	**4**	**4**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	15	CO1, CO2	L2
3, 4	CIA Exam – 2	15	CO3, CO4	L3
5	CIA Exam – 3	15	CO5	L4
1, 2	Assignment - 1	05	CO1, CO2	L2
3, 4	Assignment - 2	05	CO3, CO4	L3
5	Assignment - 3	05	CO5	L4
1, 2	Seminar - 1		-	-
3, 4	Seminar - 2		-	-
5	Seminar - 3		-	-
1, 2	Quiz - 1		-	-
3, 4	Quiz - 2		-	-
5	Quiz - 3		-	-
1 - 5	Other Activities – Mini Project	-		
	Final CIA Marks	**20**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Distribution Generation	Appr Time:	8 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
	Analyze and explain the Electric Energy generation by renewable energy sources such as solar, wind and to choose locations to install them.	CO1	L2

b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	DistributedGeneration- Introduction to distributed generation	CO1	L2
2	Source of Energy-Wind Power Plants	CO1	L3
3	Source of Energy-Solar Power Plants	CO1	L3
4	Source of Energy-Combined heat and Power	CO1	L3
5	Source of Energy-Hydro Power Plants	CO1	L3
6	Source of Energy-Wave Power Plants	CO1	L3
7	Source of Energy-Geothermal Power Plants	CO1	L3
8	Source of Energy- Thermal Power Plants	CO1	L3
c	**Application Areas**		
-	Students should be able employ / apply the Module learnings to . . .		
1	emergency power supply	CO1	L2
2	cogenration	CO1	L3
d	**Review Questions**		
-			
1	How is DG being integrated into national power sector planning	CO1	L2
2	How are the objectives of DG efforts being established.	CO1	L2
3	How clearly articulated are the direct and indirect objectives of the distributed-generation effort?	CO1	L2
4	How clear are the links between distributed-generation efforts and other development goals?	CO1	L2
5	how are choices made between competing priorities?	CO1	L2
6	How inclusive, transparent, and effective is the process for stakeholder participation in the identification of objectives?	CO1	L2
7	How are DG targets established?	CO1	L2
8	How well do targets reflect supply conditions, as well as present and future energy demand profiles?	CO1	L2
e	**Experiences**	-	-
1			
2			

Module – 2

Title:	Power system performance and overloading ,losses	Appr Time:	8Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-		-	**Level**
	Explain the impact of distributed generation on power system-overloading and losses.	CO2	L2
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	DistributedGeneration-Interface with grid	CO2	L2
2	Power system performance- Impact of DG on power system	CO2	L2

3	Hosting capacity approach	CO2	L3
4	Power quality and voltage quality, design of distributed generation	CO2	L3
5	Hosting capacity approach for events	CO2	L3
6	Methods of increasing the hosting capacity	CO2	L4
7	Overloadingandlosses- impact of DG, Overloading in radial distribution networks	CO2	L2
8	Overloading in Redundancy and meshed operations and losses	CO2	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Emergency power system	CO2	L2
2	Resource dynamics cooperation consulting services	CO2	L2
d	**Review Questions**	-	-
-			
9	How inclusive, transparent, and effective is the process for stakeholder participation in monitoring and evaluation?	CO2	L2
10	How effective is the process for monitoring and evaluating stated targets?	CO2	L2
11	What mechanisms are in place to monitor and respond to changes in energy demand over time?	CO2	L2
12	How clear and effective are policies for transitioning from DG if the central grid arrives?	CO2	L2
13	How effective are processes for the periodic review of tariffs?	CO2	L2
14	What safeguards against unanticipated policy and regulatory changes exist?	CO2	L2
15	What kinds of DG ownership models have been used successfully in the project context?	CO2	L2
16	What are the advantages and disadvantages of the different ownership and delivery models in the project context?	CO2	L2
e	**Experiences**		
1			
2			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	15EE833	Sem:	8	Marks:	30	Time:	75 minutes
Course :	Integration of Distribution generation						

-	-	**Note: Answer all questions, each carry equal marks. Module : 1, 2**	**Marks**	**CO**	**Level**
1	a	Explain with neat sketch wind power plant.	7	CO1	L2
	b	Explain with neat sketch solar power plant.	8	CO1	L2
		OR			
2	a	What is hydro power? Explain with neat sketch.	7	CO1	L2,L3
	b	Wright short note on thermal Power plant.	8	CO1	L2

3	a	How Power plants are interface with grid? Explain.	8	CO2	L2
	b	Explain current quality and voltage quality in power system	7	CO2	L2
		OR			
4	a	With a neat sketch Explain tidal power plant.	8	CO2	L2
	b	What are the steps taken to increase Hosting capacity.	7	CO2	L2

b. Assignment -1

Model Assignment Questions							
Crs Code:	15EE833	Sem:	8	Marks:	5 / 10	Time:	90 – 120 minutes
Course:	Integration of Distributed generations			Module : 1,2			

SNo	Power quality disturbances	Appr Time:	8 Hrs	Level
1	How is DG being integrated into national power sector planning	5	CO1	L2
2	How are the objectives of DG efforts being established.	5	CO1	L2
3	How clearly articulated are the direct and indirect objectives of the distributed-generation effort?	5	CO1	L2
4	How clear are the links between distributed-generation efforts and other development goals?	5	CO1	L2
5	how are choices made between competing priorities?	5	CO1	L2
6	How inclusive, transparent, and effective is the process for stakeholder participation in the identification of objectives?	5	CO1	L2
7	How are DG targets established?	5	CO1	L2
8	How well do targets reflect supply conditions, as well as present and future energy demand profiles?	5	CO1	L2
9	How inclusive, transparent, and effective is the process for stakeholder participation in monitoring and evaluation?	5	CO2	L2
10	How effective is the process for monitoring and evaluating stated targets?	5	CO2	L2
11	What mechanisms are in place to monitor and respond to changes in energy demand over time?	5	CO2	L2
12	How clear and effective are policies for transitioning from DG if the central grid arrives?	5	CO2	L2
13	How effective are processes for the periodic review of tariffs?	5	CO2	L2
14	What safeguards against unanticipated policy and regulatory changes exist?	5	CO2	L2
15	What kinds of DG ownership models have been used successfully in the project context?	5	CO2	L2
16	What are the advantages and disadvantages of the different ownership and delivery models in the project context?	5	CO2	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Voltage magnitude variations	Appr Tim	8 Hrs

		e:	
a	***Course Outcomes***	**CO**	**Bloo ms**
-	At the end of the topic the student should be able to . . .	-	**Level**
	Explain the impact of distributed generation on voltage magnitude variations of the power system.	CO3	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
1	Overloading and losses- methods of increasing the hosting capacity	CO3	L3
2	Voltage Magnitude variation- impact of DG	CO3	L2
3	Voltage margin and hosting capacity	CO3	L3
4	Design of distribution feeders	CO3	L4
5	Design of numerical approach to voltage variations	CO3	L4
6	Tap changers with line-drop compensation	CO3	L3
7	Probabilistic methods for design of distribution feeders	CO3	L3
8	Problems	CO3	L3
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Transmission and Distribution Deferal	CO3	L3
2	Peak shaving	CO3	L3
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
17	Explain the methods of Increasing the Hosting Capacity.	CO3	L3
18	Explain the Impact of Distributed Generation in distribution system	CO3	L3
19	How to calculate Voltage Margin and Hosting Capacity in distribution system	CO3	L3
20	Obtain the steps to be followed for Design of Distribution Feeders	CO3	L3
21	Explain the Numerical Approach to Voltage Variations	CO3	L3
22	Explain the conditions to be retained in Tap Changers	CO3	L3
23	What is the function of Line-Drop Compensation	CO3	L3
24	Explain the Probabilistic Methods for Design of Distribution Feeders	CO3	L3
e	**Experiences**	-	-
1			
2			

Module – 4

Title:	Voltage variations and power quality disturbances	Appr Time:	8 Hrs
a	***Course Outcomes***	**CO**	**Bloo ms**

-	At the end of the topic the student should be able to . . .	-	**Level**
	Explain the impact of distributed generation on Power quality disturbances of the power system.	CO4	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
1	Voltage Magnitude Variations- introduction	CO4	L1
2	Statistical Approach to Hosting Capacity	CO4	L2
3	Increasing the Hosting Capacity	CO4	L2
4	Problems	CO4	L2
5	Power Quality Disturbances- Impact of Distributed Generation	CO4	L1
6	Fast Voltage Fluctuations	CO4	L2
7	Voltage Unbalance	CO4	L2
8	Problems	CO4	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Demand response	CO4	L3
2	Reserves	CO4	L3
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
25	What are the reasons for Voltage Magnitude Variations	CO4	L3
26	Explain the Statistical Approach to achieve Hosting Capacity	CO4	L3
27	Explain the different Methods to improve Hosting Capacity	CO4	L3
28	How the improvement in Increasing the Hosting Capacity can be achieved	CO4	L3
29	Define Power Quality Disturbances? what are the reasons for their occurrence	CO4	L3
30	What is voltage sag? What is voltage swell	CO4	L3
31	What is meant by Fast Voltage Fluctuations	CO4	L3
32	Explain the reasons for Voltage Unbalance.	CO4	L3
e	**Experiences**	-	-
1		CO7	L2
2			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	15EE833	Sem:	8	Marks:	30	Time:	75 minutes
Course :	Integration of Distribution generation						

-	-	**Note: Answer all questions, each carry equal marks. Module : 3, 4**	**Marks**	**CO**	**Level**
1	a	Explain the methods of Increasing the Hosting Capacity.	8	CO3	L3

	b	Obtain the steps to be followed for Design of Distribution Feeders	7	CO3	L3
		OR			
2	a	What is the function of Line-Drop Compensation	7	CO3	L3
	b	Explain the Probabilistic Methods for Design of Distribution Feeders	8	CO3	L3
3	a	What are the reasons for Voltage Magnitude Variations	8	CO4	L3
	b	Explain the different Methods to improve Hosting Capacity	7	CO 4	L3
		OR			
4	a	Explain the Statistical Approach to achieve Hosting Capacity	7	CO4	L3
	b	Explain Fast Voltage Fluctuations and the also mention the reasons for their occurrence.	8	CO4	L3

b. Assignment – 2

Model Assignment Questions							
Crs Code:	15EE833	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes
Course:	Integration of Distribution generation			Module : 3, 4			

SNo	Assignment Description	Marks	CO	Level
17	Explain the methods of Increasing the Hosting Capacity.	5	CO3	L3
18	Explain the Impact of Distributed Generation in distribution system	5	CO3	L3
19	How to calculate Voltage Margin and Hosting Capacity in distribution system	5	CO3	L3
20	Obtain the steps to be followed for Design of Distribution Feeders	5	CO3	L3
21	Explain the Numerical Approach to Voltage Variations	5	CO3	L3
22	Explain the conditions to be retained in Tap Changers	5	CO3	L3
23	What is the function of Line-Drop Compensation	5	CO3	L3
24	Explain the Probabilistic Methods for Design of Distribution Feeders	5	CO3	L3
25	What are the reasons for Voltage Magnitude Variations	5	CO4	L3
26	Explain the Statistical Approach to achieve Hosting Capacity	5	CO4	L3
27	Explain the different Methods to improve Hosting Capacity	5	CO4	L3
28	How the improvement in Increasing the Hosting Capacity can be achieved	5	CO4	L3
29	Define Power Quality Disturbances? what are the reasons for their occurrence	5	CO4	L3
30	What is voltage sag? What is voltage swell	5	CO4	L3
31	What is meant by Fast Voltage Fluctuations	5	CO4	L3
32	Explain the reasons for Voltage Unbalance.	5	CO4	L3

D3. TEACHING PLAN - 3

Module – 5

Title:	Power quality disturbances	Appr Time:	8 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
	Explain the effects of integration of distributed generation on power system stability and reliability	CO 5	L4
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	Power Quality Disturbances- introduction	CO 5	L2
2	Low-Frequency Harmonics	CO 5	L2
3	High-Frequency Distortion	CO 5	L2
4	Voltage Dips	CO 5	L2
5	Increasing the Hosting Capacity	CO 5	L2
6	Introduction to methods to reduce harmonics	CO 5	L2
7	Introduction to methods to reduce frequency distortion	CO 5	L2
8	Introduction to methods to reduce voltage dips	CO 5	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Demand response	CO 5	L4
2	Reserves	CO 5	L4
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
33	What are the reasons for Power Quality Disturbances	CO 5	L2
34	Why the Fast voltage fluctuations will occur	CO 5	L2
35	What are the reasons for Voltage unbalance	CO 5	L4
36	Explain Low frequency harmonics and the causes for it	CO 5	L2
37	Explain High frequency Distortion and the reason for its cause	CO 5	L4
38	What is meant by Voltage Dips? Why does it occurs	CO 5	L2
39	What is meant by Voltage raise? Why does it occurs	CO	L4

		5	
40	How to increase Hosting Capacity?	CO 5	L2
e	**Experiences**	-	-
1			
2			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code	15EE833	Sem:	VIII	Marks:	30	Time:	75 minutes
Course :	Integration of Distribution generaton						

-	-	**Note: Answer all questions, each carry equal marks. Module : 5**	**Marks**	**CO**	**Level**
1	a	What are the reasons for Power Quality Disturbances	8	CO9	L4
	b	Explain High frequency Distortion and the reason for its cause	7	CO9	L4
		OR			
2	a	Explain Low frequency harmonics and the causes for it	7	CO9	L4
	b	What are the reasons for Voltage unbalance	8	CO9	L4
3	a	What is meant by Voltage raise? Why does it occurs	8	CO10	L2
	b	What are the reasons for Power Quality Disturbances	7	CO10	L2
		OR			
2	a	What is meant by Voltage Dips? Why does it occurs	7	CO10	L2
	b	How to increase Hosting Capacity?	8	CO10	L2

b. Assignment – 3

Model Assignment Questions							
Crs Code:	17EE833	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes
Course:	Integration of Distributed generations				Module : 5		

SNo	**Assignment Description**	**Marks**	**CO**	**Level**
33	What are the reasons for Power Quality Disturbances	5	CO5	L2
34	Why the Fast voltage fluctuations will occur	5	CO5	L2
35	What are the reasons for Voltage unbalance	5	CO5	L4
36	Explain Low frequency harmonics and the causes for it	5	CO5	L2
37	Explain High frequency Distortion and the reason for its cause	5	CO5	L4
38	What is meant by Voltage Dips? Why does it occurs	5	CO5	L2
39	What is meant by Voltage raise? Why does it occurs	5	CO5	L4
40	How to increase Hosting Capacity?	5	CO5	L2

F. EXAM PREPARATION

1. University Model Question Paper

Course:	Integration of Distributed generation					Month / Year	June / 2019	
Crs Code:	15EE833	Sem:	VIII	Marks:	80	Time:	180 minutes	

Module	Note	Answer all FIVE full questions. All questions carry equal marks.	Marks	CO	Level
1	a	Explain the properties and space requirements of solar power	08	1	2
	b	Explain the properties of small and large hydro with their variations in time	08	1	2
		OR			
2	a	Explain the properties of wind power and power distribution as a function of wind speed	08	1	3
	b	List the reasons for the new type of power production in power system	08	1	2
3	a	Discuss any two schemes of interfacing distributed generation to grid	08	2	2
	b	Discuss about primary and secondary aims of power system	08	2	2
		OR			
4	a	Explain the full power electronic coupling with grid	08	2	2
	b	Write a note on current and voltage quality concerned to distributed generation	08	2	2
5	a	Explain energy management system in distributed generation	08	3	2
	b	Explain advanced protection scheme in distributed generation	08	3	3
		OR			
6	a	With neat diagram explain two stage boosting concerned to voltage variations	10	3	3
	b	Explain basic rules of Distribution feeders	8	3	2
7	a	Explain fast fluctuations in wind and solar power	8	4	3
	b	Explain how hosting capacity can be increased by dynamic voltage control	8	4	3
		OR			
8	a	Explain voltage unbalance in weaker transmission systems	8	4	2
	b	Explain stronger Distribution system in distributed generation connected to unbalance voltage	8	4	3
9	a	Explain low frequency harmonics in induction and synchronous generators	8	5	3
	b	Explain about the balanced and unbalanced voltage dips in synchronous machines	8	5	3

		OR			
10	a	Explain parallel and series resonance concerned with harmonics	8	5	2
	b	Explain how hosting capacity can be increased by strengthening the grid and by emissions the generator limit	8	5	3

2. SEE Important Questions

Course:		Integration of Distributed generation					Month / Year	June /2019	
Crs Code:		15EE833	Sem:	VIII	Marks:	80	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.					-	-	
Module	Qno.	Important Question					**Marks**	**CO**	**Year**
1	a	Explain the properties and space requirements of solar power					08	1	2
	b	Explain the properties of small and large hydro with their variations in time					08	1	2
2	a	Explain the full power electronic coupling with grid					08	2	2
	b	Write a note on current and voltage quality concerned to distributed generation					08	2	2
3	a	With neat diagram explain two stage boosting concerned to voltage variations					10	3	3
	b	Explain basic rules of Distribution feeders					8	3	2
4	a	Explain voltage unbalance in weaker transmission systems					8	4	2
	b	Explain stronger Distribution system in distributed generation connected to unbalance voltage					8	4	3
5	a	Explain parallel and series resonance concerned with harmonics					8	5	2
	b	Explain how hosting capacity can be increased by strengthening the grid and by emissions the generator limit					8	5	3