SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Electrical and Electronics Engineering	LP: EE18704 Rev. No: 00 Date: 23/07/2021
B.E/B.Tech/M.E/M.Tech : B.E., EEE Regulation: 2018 PG Specialisation : -- Sub. Code / Sub. Name : EE18704 Wind and Solar Energy Systems Unit : I Introduction	

Unit Syllabus: Wind: Power in the Wind – Types of Wind Turbines – Basic Components of WECS (Wind Energy Conversion Systems) – WECS Schemes, Aerodynamics of blade and rotor. Solar: Various Methods of using Solar energy –Photothermal, Photovoltaic, Photosynthesis. Impacts of wind and solar energy generation on environment - Review of reference theory fundamentals.

Objective: To understand the basic concepts of Wind and Solar Energy Systems

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to Unit Syllabus - Power contained in the Wind	1	PPT
2	Types of Wind Turbines – Horizontal and Vertical axis	1	PPT
3	Basic Components of WECS (Wind Energy Conversion Systems)	1,4	PPT
4	WECS Schemes – Constant and Variable speed schemes	1.5	PPT
5	Aerodynamics of wind turbine blade and rotor	1,5	PPT
6	**Power coefficient – Significance of Betz limit**	1	PPT
7	Various Methods of using Solar energy - Photothermal, Photovoltaic, Photosynthesis	2,3	PPT
8	Impacts of wind and solar energy generation on environment	2	PPT
9	Review of reference theory fundamentals	4,5	PPT

Content beyond syllabus covered (if any): **Power coefficient – Significance of Betz limit**

* Session duration: 50 minutes

Sub. Code / Sub. Name: EE18704 Wind and Solar Energy Systems

Unit : II Fixed Speed Wind Energy Systems

Unit Syllabus: Power-Wind speed characteristics - Model of wind speed - Constant speed constant frequency systems - Drive train model – Generators: Induction and synchronous generators - Steady state modelling.

Objective: To understand the concepts of fixed speed wind energy conversion systems.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Power-Wind speed characteristics	1	PPT
11	Model of wind speed	1,5	PPT
12	Constant speed constant frequency systems	1,5	PPT
13	Drive train model	4,5	PPT
14, 15	Induction generator - Steady state modelling	1,5	PPT
16, 17	Synchronous generator - Steady state modelling	1,5	PPT
18	**Fixed speed Generators – Overview of transient modelling**	1,4,5	PPT

Content beyond syllabus covered (if any): **Fixed speed Generators – Overview of transient modelling.**

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* Session duration: 50 mins

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Sub. Code / Sub. Name: EE18704 Wind and Solar Energy Systems

Unit : III Variable Speed Wind Energy Systems

Unit Syllabus: Need of variable speed systems - Variable speed constant frequency systems - Variable speed variable frequency systems – Generators: DFIG and PMSG - Steady state modeling.

Objective: To understand the concepts of variable speed wind energy conversion systems.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Need of variable speed systems	1	PPT
20	Variable speed constant frequency systems	1.4	PPT
21	Variable speed variable frequency systems	1.4	PPT
22	Operating modes of DFIG and PMSG	1.5	PPT
23, 24	DFIG - Steady state modelling	1.5	PPT
25, 26	PMSG - Steady state modelling	1.5	PPT
27	**Variable speed Generators – Overview of transient modelling**	1.5	PPT

Content beyond syllabus covered (if any): **Variable speed Generators – Overview of transient modelling**

*** Session duration: 50 mins**

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Sub. Code / Sub. Name: EE18704 Wind and Solar Energy Systems

Unit : IV Solar PV Systems

Unit Syllabus: Basic Principle of photovoltaic conversion – Types of Solar cells, I-V Characteristics, maximum power point tracking. Selection of inverter, battery sizing and array sizing. Applications: Battery charging, Lighting, Solar PV pumps, Space Telecommunications and Solar energy storage options.

Objective: To learn basics of Solar PV systems and its Applications.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Basic Principle of photovoltaic conversion	2	PPT
29	Types of Solar cells	2	PPT
30	I-V Characteristics	2	PPT
31	Maximum power point tracking	2,3	PPT
32	Selection of inverter	6,7	PPT
33	Battery sizing and array sizing	6,7	PPT
34	Applications - Battery charging and Lighting	2,3,6	PPT
35	Applications - Solar PV pumps and Space Telecommunications	2,3,6	PPT
36	Applications - Solar energy storage options	2,3,6	PPT

Content beyond syllabus covered (if any): --

* Session duration: 50 mins

Sub. Code / Sub. Name: EE18704 Wind and Solar Energy Systems

Unit : V Analysis of Wind and PV Systems

Unit Syllabus: Stand alone operation of fixed and variable speed wind energy conversion systems and solar system - Grid connection Issues - Grid codes - Low-voltage ride through (LVRT), Grid integrated SCIG, DFIG and PMSG Based WECS, grid integrated solar system.

Objective: To provide knowledge about stand alone and grid connected renewable energy systems.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Stand alone operation of fixed speed WECS	1,4	PPT
38	Stand alone operation of variable speed WECS	1,4	PPT
39	Stand alone operation of solar PV systems	2,3	PPT
40	Grid connection Issues - Grid codes	5,8	PPT
41	**Need for Hybrid systems**	3,6	PPT
42	Low-voltage ride through (LVRT)	5,8	PPT
43	Grid integrated SCIG based WECS	5,8	PPT
44	Grid integrated DFIG and PMSG Based WECS	5,8	PPT
45	Grid integrated solar system	2,3	PPT

Content beyond syllabus covered (if any): **Need for Hybrid systems**

*** Session duration: 50 mins**

Sub Code / Sub Name: EE18704 Wind and Solar Energy Systems

REFERENCES:

1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press 2005.
2. B.H.Khan, "Non-conventional Energy sources", Tata McGraw Hill Publishing Company, New Delhi, 2009
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray. L. Johnson, "Wind energy system", prentice hall Inc, 1995.
5. L. L. Freris, Wind Energy Conversion systems, Prentice Hall, UK, 1990.
6. Solanki C.S., "Renewable Energy Technologies", PHI Learning Pvt. Ltd., 2015.
7. Rashid M. H "Power Electronics Hand book", Academic Press, 2001.
8. S.Heir "Grid Integration of WECS", Wiley 1998.

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Designation	Professor and Assistant Professor	Vice-Principal and HOD
Date	23/07/2021	23/07/2021
Remarks *: The same Lesson plan is being followed for the Academic Year 2022-2023 (odd semester)		
Remarks *: Venkatesan 26/07/2022 (Dr. VENKATESAN C, AP/EEE) N. S 26/7/22 (MS. N. SHANMUGAVADIVU) AP/EEE		KR. Santha 26.7.22 Vice Principal and HOD/EEE

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

The same lesson plan is being followed for the AY ~~2022-2~~ 2023-24 (ODD Sem).

10/8/2023
(S. SSETHURAMAN, ASP/EEE)
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