

# **SHRI VENKATESHWARA UNIVERSITY**



## **Syllabus**

### **Diploma**

**(Electrical Engineering)**

**VI SEMESTER**

**(THREE Years Programme)**

**(w.e.f. 2019-20)**

**SCHOOL OF ENGINEERING &  
TECHNOLOGY**

### ELECTRICAL ENGINEERING- VI SEMESTER

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	PEE - 601	Building Electrification	3	0	0	20	10	30		70		100	3
2	PES-666	Entrepreneurship and Start-ups	2	1	0	20	10	30		70		100	3
3	POE-061	Renewable Energy Technologies	3	0		20	10	30		70		100	3
4	POE-062	Disaster Management	3	0		20	10	30		70		100	3
5	PEE -611	Building Electrification Lab	0	0	2				10		15	25	1
6	PEE -612	Project Phase-II	0	0	12				100		100	200	6
7	PEE-613	Seminar	1	0	0				50		0	50	1
8	AUD- 111	Indian Constitution	2	0	0								
												<b>675</b>	<b>20</b>

<b>Course Code</b>		
<b>Course Title</b>		<b>BUILDING ELECTRIFICATION</b>
<b>Number of Credits</b>		<b>3 (L: 3, T: 0, P: 0)</b>
<b>Prerequisites</b>		<b>NIL</b>
<b>Course Category</b>		<b>PC</b>

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Design electrical installation systems in building complexes.

Course contents:

### **Unit – I Wiring Tools and Accessories**

Various tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, rawl punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, application, care & maintenance of tools.

Classification of electrical accessories- controlling, holding, safety, outlet

BIS symbols of following electrical accessories.

**Switch** – Their types according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP). Their types according to working such as single pole, double pole, two-way, two-way centre off, interme- diate, series parallel switch

**Holders-** Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison lamp holder, swivel lamp holder.

**Socket outlets and plugs-** two pin, three-pin, multi pin sockets, two-pin and three-pin plug.

**Others-** Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus-bar chamber.

Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

### **Unit – II Electrical Wires and Underground Cables**

Conductors: - wire, cable, bus bar, stranded conductor, cable, armoured cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS. Tools used for measurement of wire size, Wire jointing methods.

Classification of cables, low tension, high tension, and extra high tension cables, solid, oil filled and gas filled type

Cable insulation materials –vulcanized rubber (VIR), polyvinyl chloride (PVC), cross linked polythene (XLPE), impregnated paper, Selection of suitable cable size and type from standard data

Cable jointing  
methods Cable laying  
methods.

Factors determining selection of electric cables

#### Unit– III Wiring Methods and wiring layout

Factors determining the selection of wiring methods.

Classification of wiring methods.

PVC casing-capping wiring- wiring rules according to IS: 732-1983

Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring.

Comparison of various wiring systems.

General BIS rules for domestic installations.

Design, working and drawing of following electrical circuits: Simple light and fan circuits, Stair case wiring, Go-down wiring circuit, Bedroom lighting circuit, Corridor lighting circuit, Series parallel circuit, Master switch control circuit, Different lighting circuit using - Intermediate switch, Call bell circuit using bell indicator, Design of wiring circuits according to user's requirement

#### Unit– IV Residential Building Electrification

Domestic Dwellings/Residential Buildings: reading of Civil Engineering building drawing, Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732.

Electrical installation for residential building as per part I section 9 of NEC-2011

Difference between residential and industrial load, rules/requirements related to lighting load followed in electrical installations, Positioning of equipment.

Lighting and power circuits: Light and fan circuit, Power circuit

Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representation

Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switch gear.

Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labour cost

Testing of wiring installation as per IS: 732-1982: Insulation resistance - between earth and conductors, between conductors, polarity test of single pole switches. Testing of earth continuity path.

Residential building Service Connection- types Underground and overhead. Calculation of Material required for service connection

## Unit– V Protection of Electrical Installation

Fuse in electric circuit: fuse element, fuse current rating, minimum fusing current, cut-off current, fusing factor, Fuse material

Types of fuses –Re-wirable, cartridge fuses (HRC and LRC), Fuse material  
Selection of fuse.

Miniature circuit Breaker (MCB)-Construction, Principle rating and uses, Earth Leakage Circuit Breaker (ELCB)-Construction, Principle rating and uses.

System and equipment earthing and its requirements, Earth, earth electrode, earth current, earth terminal, earthing wire, earthing lead, fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance,

Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing,

## Unit– V Illumination in Residential Installation

Concept of Luminous flux, Luminous intensity, Lumen, Illumination or illuminance, Lux, Space-height ratio, utilization factor, depreciation factor, luminous efficiency-values for different luminaries.

Laws of Illumination-Inverse Square Law, Cosine Law, illumination received directly underneath, horizontal screen and screen moved horizontally at certain distance

Factors affecting the illumination. Different types of lighting arrangements,

Luminous flux of different types of light sources, Lux level required for different places as per  
SP 72: 2010.

## References:

1. Raina, K.B. and S.K.Bhattacharya, Electrical Design Estimating and Costing, New Age International Ltd., New Delhi, ISBN 978-81-224-0363-3
2. Allagappan, N. S. Ekambarram, Electrical Estimating and Costing, New Delhi, ISBN-13: 9780074624784
3. Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi, ISBN: 1234567150995
4. Gupta, J.B: A Course in Electrical Installation Estimating and Costing, S K Kataria and Sons, New Delhi, ISBN: 978-93-5014-279-0
5. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation
6. Bureau of Indian Standard, SP 30 National Electrical Code 2010
7. Bureau of Indian Standard, SP 72 National Lighting Codes 2010
8. E-REFERENCES:-
  - <http://nptel.ac.in/courses/108108076/1> , assessed on 18<sup>th</sup> January 2016
  - <http://www.electrical4u.com>, assessed on 18<sup>th</sup> January 2016
  - <https://www.youtube.com/watch?v=A9KSGAnjo2U>, assessed on 18<sup>th</sup> January 2016
  - <http://www.electricaltechnology.org/2015/09>, assessed on 30 Jan 2016
  - [www.slideshare.net/bawaparam/made-by-param](http://www.slideshare.net/bawaparam/made-by-param) assessed on 30 Jan 2016
  - [www.electricaltechnology.org/2013/09/electrical-wiring.html](http://www.electricaltechnology.org/2013/09/electrical-wiring.html) assessed on 16 March 2016.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- a) Select accessories, wires, cables and wiring systems for electrification.
- b) Design electrical wiring installation system for residential unit.
- c) Design proper illumination scheme for residential unit.
- d) Prepare wiring layouts on wiring board.
- e) Locate and diagnose faults in electrical wiring installation.
- f) Do proper earthing for building electrification.

<b>Course Code</b>		
<b>Course Title</b>		BUILDING ELECTRIFICATI ON LABORATORY
<b>Number of Credits</b>		1 (L: 0, T: 0, P: 2)
<b>Prerequisites</b>		NIL
<b>Course Category</b>		PC

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Design electrical installation systems in building complexes.

Practicals:

1. Prepare series testing board.
2. Select the electric wire using measuring and testing instruments for particular applications.
3. Identify cables of different current ratings.
4. Prepare wiring installation on a board showing control of one lamp, one fan and one socket from one switch board in PVC surface conduit wiring system.
5. Prepare wiring installation on a board.
6. Control one lamp from two different places using PVC surface conduit wiring system.
7. Prepare wiring installation on a board. Control one lamp from three different places using PVC surface conduit wiring system.
8. Prepare wiring installation on a board.
9. Perform go-down wiring for three blocks using PVC casing capping.
10. Design 2 BHK residential installation scheme and estimate the material required. And draw the details required for installation on A4 size sheet.
11. Test wiring installation using megger.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- a) Select accessories, wires, cables and wiring systems for electrification.
- b) Design electrical wiring installation system for residential unit.
- c) Design proper illumination scheme for residential unit.
- d) Prepare wiring layouts on wiring board.
- e) Locate and diagnose faults in electrical wiring installation.
- f) Do proper earthing for building electrification.

<b>Course Code</b>		<b>PES-666</b>
<b>Course Title</b>		<b>Entrepreneurship and Start-ups</b>
<b>Number of Credits</b>		<b>4</b>
<b>Prerequisites (Course code)</b>		<b>None</b>
<b>Course Category</b>		<b>HS</b>

**Course Learning Objectives:**

1. Acquiring Entrepreneurial spirit and resourcefulness.
2. Familiarization with various uses of human resource for earning dignified means of living.
3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquiring entrepreneurial quality, competency, and motivation.
5. Learning the process and skills of creation and management of entrepreneurial venture.

**Course Content:**

**Unit 1** - Introduction to Entrepreneurship and Start-ups

- Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures, Similarities/differences between entrepreneurs and managers.

**Unit 2** - Business Ideas and their implementation

- Discovering ideas and visualizing the business
- Activity map
- Business Plan

**Unit 3** - Idea to Start-up

- Market Analysis - Identifying the target market,
- Competition evaluation and Strategy Development,
- Marketing and accounting,
- Risk analysis

**Unit 4** - Management

- Company's Organization Structure,
- Recruitment and management of talent.
- Financial organization and management

**Unit 5** - Financing and Protection of Ideas



- Financing methods available for start-ups in India
- Communication of Ideas to potential investors - Investor Pitch
- Patenting and Licenses

**Unit 6:** Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy

**Learning Outcome:**

Upon completion of the course, the student will be able to demonstrate knowledge of the following topics:

1. Understanding the dynamic role of entrepreneurship and small businesses
2. Organizing and Managing a Small Business
3. Financial Planning and Control
4. Forms of Ownership for Small Business
5. Strategic Marketing Planning
6. New Product or Service Development
7. Business Plan Creation

**SUGGESTED LEARNING RESOURCES:**

	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
	<b>The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company</b>	<b>Steve Blank and Bob Dorf</b>	<b>K &amp; S Ranch ISBN – 978-0984999392</b>
	<b>The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses</b>	<b>Eric Ries</b>	<b>Penguin UK ISBN – 978-0670921607</b>
	<b>Demand: Creating What People Love Before They Know They Want It</b>	<b>Adrian J. Slywotzky with Karl Weber</b>	<b>Headline Book Publishing ISBN – 978-0755388974</b>
	<b>The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business</b>	<b>Clayton M. Christensen</b>	<b>Harvard business ISBN: 978-142219602</b>

**SUGGESTED SOFTWARE/LEARNING WEBSITES:**

- a. <https://www.fundable.com/learn/resources/guides/startup>
- b. <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate-structure/>
- c. <https://www.finder.com/small-business-finance-tips>
- d. <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>

<b>Course Code</b>		
<b>Course Title</b>		<b>Renewable Energy Technologies</b>
<b>Number of Credits</b>		<b>3 (L: 3, T: 0, P: 0)</b>
<b>Prerequisites (Course code)</b>		<b>NIL</b>
<b>Course Category</b>		<b>PC</b>

**Course Learning Objectives:**

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain the renewable energy technology equipment.

**Course Contents:****Unit - I Ocean Energy Technologies**

Ocean energy map of India and its implications; Specification, Construction and working of the following ocean energy technologies:

- Tidal power technologies
- Wave power technologies
- Marine current technologies
- Ocean Thermal Energy Conversion (OTEC) technologies

**Unit - II Solar PV and Concentrated Solar Power Plants**

- Solar Map of India: Global solar power radiation, Solar PV
- Concentrated Solar Power (CSP) plants, construction and

working of: Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors

- Solar Photovoltaic (PV) power plant: components layout, construction, working.
- Rooftop solar PV power system

### Unit – III Large Wind Power Plants

Wind Map of India: Wind power density in watts per square meter, Lift and drag principle; long path theory, Geared type wind power plants: components, layout and working, Direct drive type wind power plants: components, layout and working, Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG), Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG).

### Unit- IV Small Wind Turbines

- Horizontal axis small wind turbine: direct drive type, components and working.
- Horizontal axis small wind turbine: geared type, components and working.
- Vertical axis small wind turbine: direct drive and geared, components and working.
- Types of towers and installation of small wind turbines on roof tops and open fields.
- Electric generators used in small wind power plants.
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### Unit- V Biomass-based Power Plants

- Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste.
- Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gohar gas.
- Layout of a Bio-chemical based (e.g. biogas) power plant.
- Layout of a Thermo-chemical based (e.g. Municipal waste) power plant.
- Layout of a Agro-chemical based (e.g. bio-diesel) power plant.

### Reference Books:

- 1 O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
- 2 Neill, Simon P.; Hashemi, M. Reza: Fundamentals of

Ocean Renewable Energy: Generating Electricity from the Sea, Academic Press, ISBN:978-0-12-810448-4

3. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, Renewable Energy Systems, Pearson Education New Delhi , ISBN: 9789332586826,
4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, New Delhi, ISBN: 978-93-88028-49- 3; E-book 978-93-88028-50-9
5. Deambi, Suneel: From Sunlight to Electricity: a practical handbook on solar photovoltaic application; TERI, New Delhi ISBN:9788179935736
6. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
7. Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHI Learning, New Delhi, ISBN:978-8120351660
8. Kothari, D.P. et aL: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN: -978-81-203-4470-9
9. Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, New Delhi, ISBN: 9780195670936.

#### Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Maintain ocean thermal energy technologies
- Maintain the optimised working of solar PV and CS power plants.
- Maintain the optimised working of large wind power plants
- Maintain the optimised working of small wind turbines.
- Maintain the optimised working of biomass-based power plants.

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<b>Course Code</b>		
<b>Course Title</b>		Disaster Management
<b>Number of Credits</b>		3 (L:3, T: 0, P: 0)
<b>Prerequisites</b>		NIL
<b>Course Category</b>		OE

#### Course Learning Objectives:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organisations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

#### Course Content:

##### **Unit - I: Understanding Disaster**

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity - Disaster and Development, and disaster management.

##### **Unit - II: Types, Trends, Causes, Consequences and Control of Disasters**

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire);

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends - Emerging Risks of Disasters - Climate Change and Urban Disasters.

##### **Unit- III: Disaster Management Cycle and Framework**

Disaster Management Cycle - Paradigm Shift in Disaster Management.

Pre-Disaster - Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster - Evacuation - Disaster Communication - Search and Rescue - Emergency Operation Centre - Incident Command System - Relief and Rehabilitation -

Post-disaster - Damage and Needs Assessment, Restoration of Critical Infrastructure - Early Recovery - Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

##### **Unit- IV: Disaster Management in India**

Disaster Profile of India - Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 - Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

### Unit- V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters

S&T Institutions for Disaster Management in India

### References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

### Course outcomes:

After competing this course, student will be:

- Acquainted with basic information on various types of disasters
  - Knowing the precautions and awareness regarding various disasters
  - Decide first action to be taken under various disasters
  - Familiarised with organisation in India which are dealing with disasters
- Able to select IT tools to help in disaster management

<b>Course Code</b>		<b>AUD-111</b>
<b>Course Title</b>		<b>Indian Constitution</b>
<b>Number of Credits</b>		<b>0 (L: 2, T:0; P:0)</b>
<b>Prerequisites (Course code)</b>		<b>None</b>
<b>Course Category</b>		<b>AU</b>

#### Course Content

##### **Unit 1** - The Constitution - Introduction

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation
- State Policy Principles

##### **Unit 2** - Union Government

- Structure of the Indian Union
- President - Role and Power
- Prime Minister and Council of Ministers
- Lok Sabha and Rajya Sabha

##### **Unit 3** - State Government

- Governor - Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

##### **Unit 4** - Local Administration

- District Administration
- Municipal Corporation
- Zila Panchayat

##### **Unit 5** - Election Commission

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

Suggested Learning Resources:

	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
	<b>Ethics and Politics of the In- dian Constitution</b>	<b>Rajeev Bhargava</b>	<b>Oxford University Press, New Delhi, 2008</b>
	<b>The Constitution of India</b>	<b>B.L. Fadia</b>	<b>Sahitya Bhawan; New edition (2017)</b>
	<b>Introduction to the Consti- tution of India</b>	<b>DD Basu</b>	<b>Lexis Nexis; Twenty- Third 2018 edition</b>

**Suggested Software/Learning Websites :**

- a. <https://www.constitution.org/cons/india/const.html>
- b. <http://www.legislative.gov.in/constitution-of-india>
- c. <https://www.sci.gov.in/constitution>
- d. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>