

# **SHRI VENKATESHWARA UNIVERSITY**



## **Syllabus**

### **DIPLOMA**

**(Civil Engineering)**

**VI SEMESTER**

**(Three Years Programme)**

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

**SCHOOL OF ENGINEERING &  
TECHNOLOGY**

**Civil Engineering  
SEMESTER-VI**

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	PCE - 601	Public Health Engineering	2	0	0	20	10	30		70		100	2
2	PCE-602	Repairs and Maintenance of Structures	3	0	0	20	10	30		70		100	3
3	PES - 666	Entrepreneurship and Start-ups	3	1	0	20	10	30		70		100	4
4	POE-061	Renewable Energy Technologies	3	0	0	20	10	30		70		100	3
5	POE-062	Disaster Management	3	0	0	20	10	30		70		100	3
6	PCE-611	Public Health Engineering Lab	0	0	2				10		15	25	1
7	PCE-612	Project Phase-II	0	0	12				100		100	200	6
	PCE- 613	Seminar	1	0	0				50			50	1
8	AUD-111	Indian Constitution	2	0	0								0
												775	23

Course Code	:	PCE-601
Course Title	:	Public Health Engineering
Number of Credits	:	2 (L: 2, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PC

Course Objectives:

Following are the objectives of this course:

- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the plotting of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

Course Content

**Unit – I Sources, Demand and Quality of water**

- Water supply schemes - Objectives, components,
- Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.
- Demand of water: Factors affecting rate of demand, Variations of water demands, Forecast- ing of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town.
- Quality of water: Need for analysis of water, Characteristics of water-Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Flu- oride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.

UNIT II Purification of water

- Purification of Water: Objectives of water treatment, Aeration-objects and methods of aer- ation, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator.
- Filtration - mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, op- erational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlo- rine and its importance, Flow diagram of water treatment plants.
- Miscellaneous water Treatments: Introduction to water softening, Defluoridation tech- niques.

### UNIT III Conveyance and Distribution of water

- Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline.
- Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

### UNIT IV Domestic sewage and System of Sewerages

- Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions  
- Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation-

Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe. Building Sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types, qualities of good trap. Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape.

- Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

### UNIT V Characteristics and treatment of Sewage

- Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance., Central Pollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant.
- Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.

### Suggested learning resources

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers

7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

Course outcomes:

After competing this course, student will be able to:

- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labelled layout for water supply scheme.
- Device suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.
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Course Code	:	PCE-602
Course Title	:	Repairs and Maintenance of Structures
Number of Credits	:	3 (L: 3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	PE

### **Course Objectives:**

Following are the objectives of this course:

- To learn about types of maintenance techniques
- To understand causes of various types of damages.
- To know about relevant materials for repair.
- To learn methods of retrofitting for different structures.

Course Content:

### **Unit – I Basics of maintenance**

- Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration.
- Necessity, objectives and importance of maintenance.
- Approach of effective management for maintenance.
- Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

Unit- II Causes and detection of damages

- Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement.
- Various aspects of visual observations for detection of damages.
- Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection microscope, digital crack measuring gauge.
- Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

#### Unit- III Materials for maintenance and repairs

- Types of repair material, material selection.
- Essential parameters for maintenance and repair materials such - bond with substrate, du- rability.
- Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement.
- Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates.
- Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement con- crete, emulsions and paints.

#### Unit- IV Maintenance and repair methods for masonry Construction

- Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation.
- Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints.
- Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing.
- Remedial measures for dampness & efflorescence in wall.

#### Unit- V Maintenance and repair methods for RCC Construction

- Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation.
- Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer con- crete, corrosion protection such as jacketing.
- Building cracks and its prevention, common methods for dormant crack repairs such as Ep- oxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting.
- Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brack- ets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.

Suggested learning resources:

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi
2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies
3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
4. Relevant BIS codes

Course outcomes:

After competing this course, student will be able to:

- Decide which type of maintenance is needed for a given damaged structure
- Assess causes of damages various types of structures.
- Select the relevant material for repair of the given structure.
- Apply relevant method of retrofitting for re-strengthening of structures.
- Suggest relevant technique to restore the damages of the given structural elements.

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

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:

S. No.	Title of Book	Author	Publication
1.	The Startup Owner’s Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN – 978-0984999392
2.	The Lean Startup: How Today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN – 978-0755388974
4.	The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business ISBN: 978-142219602

**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/>

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

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 gobar 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 ap- plication; 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., Kasta, 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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Course Code	:	
Course Title	:	Disaster Management
Number of Credits	:	3 (L:3, T: 0, P: 0)
Prerequisites	:	NIL
Course Category	:	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, tsunamis, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunderstorms, 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

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

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>S. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Constitution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

**Suggested Software/Learning Websites:**

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