



# **SREE SAKTHI ENGINEERING COLLEGE**

TNEA Admission Code **2673**

OOTY MAIN ROAD, KARAMADAI, | MOB : +91 92445 04444, +91 92445 02277  
COIMBATORE- 641104. INDIA | Web : [www.sreesakthi.edu.in](http://www.sreesakthi.edu.in)

Affiliated to Anna University & Approved by AICTE, Accredited by NAAC

## **1.3.1A**

**Institution integrates crosscutting issues relevant to professional ethics, gender, human values, environment and sustainability into the curriculum**



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## REGULATION 2017

### 1.3.1 Institution integrates crosscutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

S.no	Course code	Subject Name	Program Name
1	GE8291	Environmental Science and Engineering	CSE,ECE,EEE,MECH,CIVIL
2	GE8071	Disaster management	CSE,ECE
3	GE8076	Professional Ethics in Engineering	CSE,ECE,EEE,MECH,CIVIL
4	GE8074	Human rights	CSE,ECE,EEE,MECH,CIVIL
5	GE8077	Total quality management	ECE,EEE,MECH,CIVIL
6	EE8016	Energy Management and Auditing	EEE
7	EN8491	Water supply engineering	CIVIL
8	CE8512	Water and Waste Water Analysis Laboratory	CIVIL
9	EN8592	Waste water engineering	CIVIL
10	CE8603	Irrigation engineering	CIVIL
11	CE8612	Irrigation and Environmental Engineering Drawing	CIVIL
12	EN8591	Municipal solid waste management	CIVIL

**PRINCIPAL**

**Dr R. PRABHU**

**PRINCIPAL,**

**SAKTHI ENGINEERING COL**

**COIMBATORE-641 104**

**OBJECTIVES:**

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**

14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

**UNIT II ENVIRONMENTAL POLLUTION**

8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

**UNIT III NATURAL RESOURCES**

10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation –

consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

#### **UNIT V HUMAN POPULATION AND THE ENVIRONMENT**

6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

**TOTAL: 45 PERIODS**

#### **OUTCOMES**

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

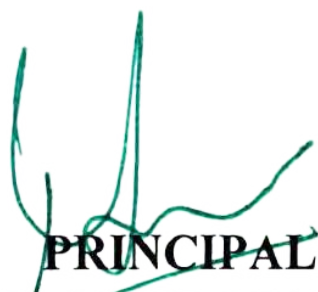
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

#### **TEXTBOOKS**

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

#### **REFERENCES**

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. ErachBharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hyderabad, 2015.
3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.



**PRINCIPAL**  
**Dr R. PRABHU**  
**PRINCIPAL,**  
**SAKTHI ENGINEERING COL**  
**COIMBATORE-641 104**

**OBJECTIVES:**

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

**UNIT I****INTRODUCTION TO DISASTERS**

9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

**UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)**

9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

**UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT**

9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

**UNIT IV DISASTER RISK MANAGEMENT IN INDIA**

9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

**UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELDWORKS**

9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**TOTAL: 45 PERIODS****OUTCOMES**

The students will be able to Differentiate the types of disasters, causes and their impact on environment and society

- Assess vulnerability and various methods of risk reduction measures as well as mitigation.

## TEXTBOOKS

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010, ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K. Sreeja S. Nair, Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerability India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

## REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005



**PRINCIPAL**  
**Dr R. PRABHU**  
PRINCIPAL,  
SAKTHI ENGINEERING COL  
COIMBATORE-641 104

**OBJECTIVE:**

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

**UNIT I HUMAN VALUES 10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

**UNIT II ENGINEERING ETHICS 9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

**UNIT V GLOBAL ISSUES 8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Code of Conduct – Corporate Social Responsibility.

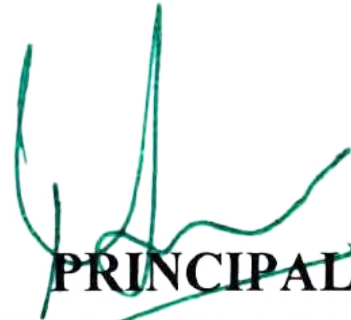
**TOTAL: 45 PERIODS****OUTCOMES:**

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

**TEXT BOOKS:**

1. Mike W. Martin and Roland Schinzinger, –Ethics in EngineeringII, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, –Engineering EthicsII, Prentice Hall of India, New Delhi, 2004.

3. John R Boatright, —Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility, McGraw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, \_ Value Education', Vethathiri publications, Erode, 2011.



**PRINCIPAL**  
**Dr R. PRABHU**  
**PRINCIPAL,**  
**SAKTHI ENGINEERING COL**  
**COIMBATORE-641 104**



**OBJECTIVE:**

- To facilitate the understanding of Quality Management principles and process.

**UNIT I INTRODUCTION**

9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention.

**UNIT II TQM PRINCIPLES**

9

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS AND TECHNIQUES I**

9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

**UNIT IV TQM TOOLS AND TECHNIQUES II**

9

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

**UNIT V QUALITY MANAGEMENT SYSTEM**

9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000— ISO 9001 Requirements—Implementation— Documentation—Internal Audits—Registration— ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001— Benefits of EMS.

**TOTAL: 45 PERIODS****OUTCOME:**

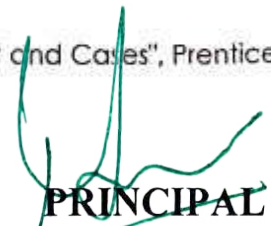
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

**TEXT BOOK:**

1. Dale H.Besterfield, Carol B.Michna,Glen H. Besterfield,MaryB.Sacre,HemantUrdhwareshe and RashmiUrdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

**REFERENCES:**

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8 th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

  
**PRINCIPAL**  
**Dr R. PRABHU**  
PRINCIPAL,  
SAKTHI ENGINEERING COL  
COIMBATORE-641 104

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HUMAN RIGHTS

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**OBJECTIVES**

- To sensitize the Engineering students to various aspects of Human Rights.

**UNIT I**

9

Human Rights – Meaning, origin and Development, Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

**UNIT II**

9

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864, Universal Declaration of Human Rights, 1948. Theories of Human Rights.

**UNIT III**

9

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

**UNIT IV**

9

Human Rights in India – Constitutional Provisions / Guarantees.

**UNIT V**

9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disability persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

**TOTAL : 45 PERIODS**

**OUTCOME :**

- Engineering students will acquire the basic knowledge of human rights.

**REFERENCES:**

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.

  
**PRINCIPAL**  
**Dr R. PRABHU**  
**PRINCIPAL,**  
**SAKTHI ENGINEERING COL**  
**COIMBATORE-641 104**

**OBJECTIVES**

To impart knowledge about the following topics:

- To impart concepts behind economic analysis and Load management.
- Energy management on various electrical equipments and metering.
- Concept of lighting systems and cogeneration.

**UNIT I INTRODUCTION 9**

Basics of Energy – Need for energy management – Energy accounting – Energy monitoring, targeting and reporting - Energy audit process.

**UNIT II ENERGY MANAGEMENT FOR MOTORS AND COGENERATION 9**

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility of cogeneration – Electrical interconnection.

**UNIT III LIGHTING SYSTEMS 9**

Energy management in lighting systems – Task and the working space - Light sources – Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect of harmonics, lighting and energy standards.

**UNIT IV METERING FOR ENERGY MANAGEMENT 9**

Metering for energy management – Units of measure - Utility meters – Demand meters – Paralleling of current transformers – Instrument transformer burdens – Multi tasking solid state meters, metering location vs requirements, metering techniques and practical examples.

**UNIT V ECONOMIC ANALYSIS AND MODELS 9**

Economic analysis – Economic models - Time value of money - Utility rate structures – Cost of electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economic justification.

**TOTAL : 45 PERIODS**

**OUTCOME**


- Ability to understand the basics of Energy audit process.
- Ability to understand the basics of energy management by cogeneration
- Ability to acquire knowledge on Energy management in lighting systems
- Ability to impart concepts behind economic analysis and Load management.
- Ability to understand the importance of Energy management on various electrical equipment and metering.
- Ability to acquire knowledge on HVAC.

**TEXT BOOKS**

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006

## REFERENCES

1. Reay D.A, Industrial Energy Conservation, 1 st edillon, Pergamon Press, 1977.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.



**PRINCIPAL**  
**Dr R. PRABHU**  
**PRINCIPAL,**  
**SAKTHI ENGINEERING COL**  
**COIMBATORE-641 104**

**OBJECTIVE**

To equip the students with the principles and design of water treatment units and distribution system.

**UNIT I SOURCES OF WATER 9**

Public water supply system – Planning, Objectives, Design period, Population forecasting; Water demand – Sources of water and their characteristics, Surface and Groundwater – Impounding Reservoir – Development and selection of source – Source Water quality – Characterization – Significance – Drinking Water quality standards.

**UNIT II CONVEYANCE FROM THE SOURCE 9**

Water supply – intake structures – Functions; Pipes and conduits for water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – appurtenances – Types and capacity of pumps – Selection of pumps and pipe materials.

**UNIT III WATER TREATMENT 9**

Objectives – Unit operations and processes – Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation – Clarifloccuator-Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - Residue Management – Construction, Operation and Maintenance aspects.

**UNIT IV ADVANCED WATER TREATMENT 9**

Water softening – Desalination- R.O. Plant – demineralization – Adsorption - Ion exchange– Membrane Systems – RO Reject Management - Iron and Manganese removal - Defluoridation - Construction and Operation & Maintenance aspects – Recent advances - MBR process

**UNIT V WATER DISTRIBUTION AND SUPPLY 9**

Requirements of water distribution – Components – Selection of pipe material – Service reservoirs– Functions – Network design – Economics – Analysis of distribution networks –Computer applications – Appurtenances – Leak detection. Principles of design of water supply in buildings – House service connection – Fixtures and fittings, systems of plumbing and types of plumbing.

**TOTAL: 45 PERIODS**

**OUTCOMES**

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport,
- treatment and distribution the knowledge in various unit operations and processes in water treatment
- an ability to design the various functional units in water treatment
- an understanding of water quality criteria and standards, and their relation to public health
- the ability to design and evaluate water supply project alternatives on basis of chosen criteria.

**TEXTBOOKS**

1. Garg, S.K. Environmental Engineering, Vol.I Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., Water Supply Engineering, Vol.I Standard Book House, New Delhi, 2010.

## REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Syed R. Qasim and Edward M. Molley Guang Zhu, Water Works Engineering Planning,



**PRINCIPAL**  
**Dr R. PRABHU**  
PRINCIPAL,  
SAKTHI ENGINEERING COL  
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**OBJECTIVE**

The objectives of this course is to help students develop the ability to apply basic understanding of physical, chemical, and biological phenomena for successful design, operation and maintenance of sewage treatment plants.

**UNIT I PLANNING AND DESIGN OF SEWERAGE SYSTEM 9**

Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - sewer appurtenances - corrosion in sewers - prevention and control - sewage pumping-drainage in buildings-plumbing systems for drainage - Rain Watering.

**UNIT II PRIMARY TREATMENT OF SEWAGE 9**

Objectives - Unit Operations and Processes - Selection of treatment processes - Onsite sanitation - Septic tank- Grey water harvesting - Primary treatment - Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks - Construction, Operation and Maintenance aspects.

**UNIT III SECONDARY TREATMENT OF SEWAGE 9**

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended aeration systems -Trickling filters- Sequencing Batch Reactor(SBR) - Membrane Bioreactor - UASB - Waste Stabilization Ponds - - Other treatment methods -Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects.

**UNIT IV DISPOSAL OF SEWAGE 9**

Standards for- Disposal - Methods - dilution - Mass balance principle - Self purification of river- Oxygen sag curve - deoxygenation and reaeration - Streeter-Phelps model - Land disposal - Sewage farming - sodium hazards - Soil dispersion system.

**UNIT V SLUDGE TREATMENT AND DISPOSAL 9**

Objectives - Sludge characterization - Thickening - Design of gravity thickener- Sludge digestion - Standard rate and High rate digester design- Biogas recovery - Sludge Conditioning and Dewatering - Sludge drying beds- ultimate residue disposal - recent advances.

**TOTAL: 45 PERIODS****OUTCOMES:**

The students completing the course will have

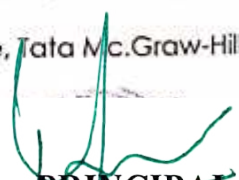
- An ability to estimate sewage generation and design sewer system including sewage pumping stations
- The required understanding on the characteristics and composition of sewage, self purification of streams
- An ability to perform basic design of the unit operations and processes that are used in sewage treatment
- Understand the standard methods for disposal of sewage.
- Gain knowledge on sludge treatment and disposal.

**TEXTBOOKS**

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015.
2. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2014.
3. Punmia, B.C., Jain, A.K., and Jain.A.K., Environmental Engineering, Vol.II, Laxmi Publications, 2010.

**REFERENCES**

1. Manual on Sewerage and Sewage Treatment Systems Part A,B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering-Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.

  
**PRINCIPAL**  
**Dr R. PRABHU**  
 PRINCIPAL,  
 SAKTHI ENGINEERING COL  
 COIMBATORE-641 104

**COURSE OBJECTIVES**

- To analyse the physical, chemical and biological characteristics of water and wastewater
- To quantify the dosage requirement for coagulation process
- To study the growth of micro-organism and its quantification
- To quantify the sludge

**Course Content**

1. Physical, Chemical and biological characteristics of water and wastewater
2. Jar test
3. Chlorine demand and residual test
4. Growth of micro-organism

**COURSE OUTCOME**

On the completion of the course, the students will be able to:

- Quantify the pollutant concentration in water and wastewater
- Suggest the type of treatment required and amount of dosage required for the treatment
- Examine the conditions for the growth of micro-organisms

**TOTAL: 60 PERIODS**

**List of Experiments**

1. Determination of pH, Turbidity and conductivity
2. Determination of Hardness
3. Determination of Alkalinity and Acidity
4. Determination of Chlorides
5. Determination of Phosphates and Sulphates
6. Determination of iron and fluoride
7. Determination of Optimum Coagulant dosage
8. Determination of residual chlorine and available chlorine in bleaching powder
9. Determination of Oil, and Grease
10. Determination of suspended, settleable, volatile and fixed solids
11. Determination Dissolved Oxygen and BOD for the given sample
12. Determination of COD for given sample
13. Determination of SVI of Biological sludge and microscopic examination
14. Determination of MPN index of given water sample



**PRINCIPAL**  
**Dr R. PRABHU**  
**PRINCIPAL,**  
**SAKTHI ENGINEERING COL**  
**COIMBATORE-641 104**



**OBJECTIVE**

The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

<b>UNIT I</b>	<b>CROP WATER REQUIREMENT</b>	<b>9</b>
Need and classification of irrigation- historical development and merits and demerits of irrigation types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods		
<b>UNIT II</b>	<b>IRRIGATION METHODS</b>	<b>9</b>
Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.		
<b>UNIT III</b>	<b>DIVERSION AND IMPOUNDING STRUCTURES</b>	<b>9</b>
Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages-		
<b>UNIT IV</b>	<b>CANAL IRRIGATION</b>	<b>9</b>
Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy's and Lacey's Regime theory-Design of unlined canal		
<b>UNIT V</b>	<b>WATER MANAGEMENT IN IRRIGATION</b>	<b>9</b>
Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On farm development works-Participatory irrigation management- Water resources associations- Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation		

**TOTAL :45 PERIODS****OUTCOMES:**

Students will be able to

- Have knowledge and skills on crop water requirements.
- Understand the methods and management of irrigation.
- Gain knowledge on types of Impounding structures
- Understand methods of irrigation including canal irrigation.
- Get knowledge on water management on optimization of water use.

**TEXTBOOKS:**

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

**REFERENCES:**

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.

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**OBJECTIVE**

At the end of the semester, the student shall conceive, design and draw the irrigation and environmental engineering structures in detail showing the plan, elevation and Sections.

**PART A: IRRIGATION ENGINEERING****1. TANK COMPONENTS**

9

Fundamentals of design - Tank surplus weir - Tank sluice with tower head - Drawings showing foundation details, plan and elevation

**2. IMPOUNDING STRUCTURES**

6

Design principles - Earth dam - Profile of Gravity Dam

**3. CROSS DRAINAGE WORKS**

6

General design principles - Aqueducts - Syphon aqueduct (Type III) - Canal drop (Notch Type) - Drawing showing plan, elevation and foundation details.

**4. CANAL REGULATION STRUCTURES**

9

General Principles - Direct Sluice - Canal regulator - Drawing showing detailed plan, elevation and foundation details.

**PART B: ENVIRONMENTAL ENGINEERING****1. WATER SUPPLY AND TREATMENT**

15

Design and Drawing of flash mixer, flocculator, clarifier - Rapid sand filter - Service reservoirs - Pumping station - House service connection for water supply and drainage.

**2. SEWAGE TREATMENT & DISPOSAL**

15

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process - Aeration tank - Trickling filter - Sludge digester - Sludge drying beds - Septic tanks and disposal arrangements.

**TOTAL: 60 PERIODS****OUTCOME**

The students after completing this course will be able to design and draw various units of Municipal water treatment plants and sewage treatment plants.

**TEXTBOOKS**

1. SatyaNarayana Murthy Challa, "Water Resources Engineering: Principles and Practice", New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
3. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.
4. Manual on "Sewerage and Sewage Treatment Systems- Part A, B and C" CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.

**REFERENCES**

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.
3. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002.
4. Peary, H.S., ROWE, D.R., Tchobanoglous, G., "Environmental Engineering", McGraw-HillBook Co., New Delhi, 1995.
5. Metcalf and Eddy, "Wastewater Engineering, Treatment and Reuse", Tata McGraw-Hill, New Delhi, 2010.
6. Qasim, S.R., Motley, E.M and Zhu.G. "Water works Engineering - Planning, Design and Operation", Prentice Hall, New Delhi, 2009.
7. Qasim, S. R. "Wastewater Treatment Plants, Planning, Design", Press, New York, 2010

**PRINCIPAL****Dr R. PRABHU****PRINCIPAL,****SAKTHI ENGINEERING COL  
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**OBJECTIVE**

To make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

**UNIT I****SOURCES AND CHARACTERISTICS**

9

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) – Role of public and NGO's- Public Private participation – Elements of Municipal Solid Waste Management Plan.

**UNIT II****SOURCE REDUCTION , WASTE STORAGE AND RECYCLING**

8

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste –On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

**UNIT III****COLLECTION AND TRANSFER OF WASTES**

8

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.

**UNIT IV****PROCESSING OF WASTES**

12

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

**UNIT V****WASTE DISPOSAL**

8

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

**TOTAL: 45 PERIODS****OUTCOMES:**

The students completing the course will demonstrate

- Understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.
- Reduction, reuse and recycling of waste.
- Ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste.
- Knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.
- Design and operation of sanitary landfill.

**TEXTBOOKS**

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.

**REFERENCES**

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi.
- 2 George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste McGraw Hill, New York.

**PRINCIPAL****Dr R. PRABHU**

**PRINCIPAL,  
SAKTHI ENGINEERING COL  
COIMBATORE-641 104**