| CRITERION 1 Curricular Aspects | 1.3 Curriculum Enrichment |
|---|---|
| *1.3.1 Institution integrates cross-cutting issues relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability, and Human Values into the curriculum* | |

# List and Syllabus of the courses addressing the Gender, Environment and Sustainability, Human Values and Professional Ethics

| S.No. | Course Name | Offering Programme | Relevance to Cross Cutting Issues |
|---|---|---|---|
| 1 | Professional Ethics | All programs | Professional Ethics |
| 2 | Environmental Science | All programs | Environment and Sustainability |
| 3 | Value Education and Human Rights | All programs | Human Values |
| 4 | Gender equality | All programs | Gender |
| 5 | Indian Constitution | All programs | Human Values and Professional Ethics |
| 6 | Advanced IC Engines | UG - Mechanical Engineering | Environment |
| 7 | Refrigeration and Air conditioning | UG - Mechanical Engineering | Environment |
| 8 | Cyber Forensics | UG - Computer Science and Engineering | Human Values and Professional Ethics |
| 9 | Green Computing | UG - Computer Science and Engineering | Environment and Sustainability |
| 10 | Cyber Security | UG - Computer Science and Engineering | Human Values and Professional Ethics |
| 11 | Energy Audit | UG - Electrical and Electronics Engineering | Environment and Sustainability and Professional Ethics |
| 12 | Electrical Equipment's Erection, Testing and Commissioning | UG - Electrical and Electronics Engineering | Environment and Sustainability, Professional Ethics |
| 13 | Non- Conventional Energy Resources and Applications | UG - Electrical and Electronics Engineering | Environment and Sustainability |
| 14 | Solar Power Plants | UG - Electrical and Electronics Engineering | Environment and Sustainability |
| 15 | Renewable Energy Laboratory | UG - Electrical and Electronics Engineering | Environment and Sustainability |

| S.No. | Course Name | Offering Programme | Relevance to Cross Cutting Issues |
|---|---|---|---|
| 16 | Solar and Wind Energy Systems | UG - Electrical and Electronics Engineering | Environment and Sustainability |
| 17 | Consumer Electronics | UG - Electrical and Electronics Engineering | Environment and Sustainability |
| 18 | IoT application in agriculture engineering | UG - Agriculture Engineering | Environment and Sustainability |
| 19 | Micro Irrigation System | UG - Agriculture Engineering | Environment and Sustainability |
| 20 | Automation in Agriculture | Common to Mech, IT & Agri | Environment and Sustainability, Human Values and Professional Ethics |
| 21 | Industrial Waste Management | UG - Civil Engineering | Environment and Sustainability |
| 22 | Air Pollution and Control Engineering | UG - Civil Engineering | Environment and Sustainability |
| 23 | Disaster Management | UG - Civil Engineering | Environment and Sustainability |
| 24 | Environmental Science and Engineering | UG - Civil Engineering | Environment and Sustainability |
| 25 | Green Building Concepts | UG - Civil Engineering | Environment and Sustainability |
| 26 | Water Conservation Techniques | UG - Civil Engineering | Environment and Sustainability |
| 27 | Polymer Technology | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 28 | Fertilizer Technology | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 29 | Air Pollution and Control | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 30 | Waste Water Treatment | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 31 | Electrochemical Engineering | UG - Agriculture Engineering | Environment and sustainability / Human values |

| S.No. | Course Name | Offering Programme | Relevance to Cross Cutting Issues |
|---|---|---|---|
| 32 | Energy Engineering | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 33 | Modern Separation Process | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 34 | Chemical Process Plant Safety | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 35 | Corrosion Science and Engineering | UG - Agriculture Engineering | Environment and sustainability /Human values |
| 36 | Energy Storage Systems | UG - Agriculture Engineering | Environment and sustainability/ Human values |
| 37 | Pedagogy Studies | All PG Programs | Human Values and Professional Ethics |
| 38 | English for Research Paper Writing | All PG Programs | Human Values and Professional Ethics |
| 39 | Research Methodology and IPR | All PG Programs | Human Values and Professional Ethics |
| 40 | Digital Forensics | PG - Computer Science and Engineering | Human values and Professional Ethics |
| 41 | Biometrics | PG - Computer Science and Engineering | Human values and Professional Ethics |
| 42 | Smart City Technologies | PG - Computer Science and Engineering | Environment and Sustainability |

| 19UGM731 | PROFESSIONAL ETHICS & HUMAN VALUES | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | P/F |

**OBJECTIVES :**

- 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 | 7 |
|---|---|---|

Morals- Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage - Valuing Time - Co-operation –Commitment – Empathy- self-Confidence –Character.

| UNIT II | ENGINEERING ETHICS | 7 |
|---|---|---|

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues –Uses of Ethical Theories.

| UNIT III | ENGINEERING AS SOCIAL EXPERIMENTATION | 4 |
|---|---|---|

Engineering Harmony in the family – Harmony in the society – Trust and Respect – Universal harmonious order

| UNIT IV | SAFETY, RESPONSIBILITIES AND RIGHTS | 6 |
|---|---|---|

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 | 6 |
|---|---|---|

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development– Engineers as Managers – Consulting Engineers – Honesty – Moral Leadership – Sample Code of Conduct.

**TOTAL : 30 PERIODS**

**COURSE OUTCOMES:**

After successful completion of this course the students will be able to:

1. Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
4. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

| 19UCY204 | ENVIRONMENTAL SCIENCE | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**PRE-REQUISITE:**

**COURSE OBJECTIVES :**

- To understand the concepts of Environment and ecosystem.
- To acquire knowledge about the impact of environmental pollution.
- To understand the importance of environmental issues in the society.
- To gain knowledge about the impact of environment related to human health.
- To gain knowledge in alternative energies.

| UNIT I | ENVIRONMENT AND ECOSYSTEMS | 9 |
|---|---|---|

Definition, scope and importance of environment – Need for public awareness – Concept of eco system- Structure and function of ecosystem – Producers, consumers and decomposers- Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Aquatic ecosystems (c) Grassland ecosystem.

| UNIT II | ENVIRONMENTAL POLLUTION | 9 |
|---|---|---|

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- pollution case studies - Role of an individual in prevention of pollution -Disaster management: floods, earthquake, cyclone and landslides.

| UNIT III | SOCIAL ISSUES AND THE ENVIRONMENT | 9 |
|---|---|---|

Water conservation, rain water harvesting, watershed management – Climate change, globalwarming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. Environmental laws/Acts, (EPA).

| UNIT IV | HUMAN POPULATION AND THE ENVIRONMENT | 9 |
|---|---|---|

Population growth, variation among nations – Population explosion – Human rights – 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.

| UNIT V | FUTURE POLICY AND ALTERNATIVES | 9 |
|---|---|---|

Introduction to future policy and alternatives-fossil fuels-nuclear energy-solar energy-wind energy - hydroelectric energy-geothermal energy - tidal energy – sustainability - green power-nanotechnology.

**TOTAL: 45 Periods**

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Understand the basic concept of structure and function of ecosystem (Understand)
- Apply the knowledge of various pollution types to prevent the ecosystem and Environment (Apply)
- Analyze the environmental problem to report the social issues and the environment. (Analyze)
- Compare the suitable methods for conservation and sustainable development of natural resources (Analyze)
- Apply the principles of value education with respect to human population to preserve environment (Apply)
- Analyze the current energy crisis and suggest a suitable sustainable alternative that promotes social health and environmental prospects. (Analyze)

**TEXT BOOKS:**

1. Anubha Kaushik, kaushik C.P., “Environmental Science and Engineering”, Third Edition, New AgeInternational, New Delhi, 2009.
2. Benny Joseph “Environmental Science and Engineering”, Tata Mc-Graw Hill, New Delhi, 2006.

**REFERENCE BOOKS:**

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, Pearson Education, Upper saddle River, New Jersey, 2008.
2. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Company, Belmont, California,2005.
3. De A.K., “Environmental Chemistry”, Wiley Eastern Ltd., New Delhi, 2001.
4. Trivedi R.K., Goel P.K., “Introduction to Air Pollution”, Techno-Science Publication, Jaipur,2005.

| 19UGM431 | GENDER EQUALITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | P/F |

**COURSE OBJECTIVES :**

- To introduce basic concepts relating to gender and to provide logical understanding of gender roles.

| UNIT I | GENDER SENSITIZATION | 5 Hrs |
|---|---|---|

Definition of gender, Perspectives-Gender sensitive approach- Gender and sex- Social construction of gender and gender roles- Socialization- institutions of socialization- changing content and context of gender-need for re-socialization. Gender Stereotyping and Gender Discrimination.

| UNIT II | GENDER EQUALITY AND CONSTITUTION | 5 Hrs |
|---|---|---|

Indian constitution related to equality - Fundamental rights - Directive principles of state policy - right to equality - rights against exploitation - cultural and educational rights - the right to constitutional remedy - University Declaration of Human Rights - Enforcement of Human Rights for Women and Children - Role of Cells and Counseling Centers- Internal Complaints Committee - Legal AID cells, Help line, State and National level Commission.

| UNIT III | GENDER ROLES & EQUALITY | 5 Hrs |
|---|---|---|

Gender & Morality – Structural and functionalist views of Gender- Gender in the Classroom- Beyond access for girls and boys- Gender equality in schools- Gender equality and adult basic education- Developing capacity to achieve gender equality in education- Individuality and removal of gender stereotypes- Respect for each other's-Promote equal opportunity.

**TOTAL: 30 Periods**

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Describe the social construction of gender and sexuality and their influence in social context. **(Understand)**
- Analyze how the concepts of gender equality are created, maintained, and/or challenged. (**Analyze)**
- Apply concepts of gender roles and equality in classroom, school, disciplinary or interdisciplinarycreative, scholarly, and/or activist project. **(Apply)**

**REFERENCES:**

1. Sheila Aikman and Elaine Unterhalter, "Practising Gender Equality in Education", Oxfam GB, 2007.
2. Pasadena and Hackensack, "Gender roles and Equality", Salem Press,2011.

| 15UGS331 | VALUE EDUCATION AND HUMAN RIGHTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | P/F |

**COURSE OBJECTIVES :**

- To inculcate the values of Humanism, Culture and to have an awareness of Human Rights.
- To impart knowledge and develop a sensitivity to the diverse Indian culture.

| UNIT I | VALUE EDUCATION | 6 |
|---|---|---|

Introduction – Value education - Definition - Why values? - need for inculcation - sources of values- Personal values, Social values, Professional values, Moral values and Behavioral values.

| UNIT II | HUMAN VALUES | 6 |
|---|---|---|

Values needed for life - love & Compassion, Truth & Tolerance, Fairness & Obedience – Respect Empathy – Protection – Humility & Harmony – Principles of happy living – Stress management

| UNIT III | SOCIAL VALUES | 6 |
|---|---|---|

Social values and personality – Role models – National leaders – freedom fighters, Social reformers & Value based anecdotes

| UNIT IV | RESPONSIBILITIES | 6 |
|---|---|---|

Social values-Five responsibilities: to self-family, environment, society and universe- peace within, family & universe; Unethical standards in words and how to correct in deeds, in thought, its deleterious effects in society, deterioration of culture and traditional values- remediation for better understanding of such values and its implications

| UNIT V | HUMAN RIGHTS | 6 |
|---|---|---|

Human Rights – Universal Declaration of human rights - Human Rights violation - National Integration – Peace and nonviolence – the role of media in value building - Consumer awareness - Case Study

**TOTAL: 30 Periods**

COURSE OUTCOMES**:**

After the successful completion of this course, the student will be able to

- Acquire a holistic vision and growth to become an integrated personality.
- Imbibe the essence of spirituality by which they will manifest the noble virtues of a universal brotherhood and benevolence

**TEXT BOOKS:**

1. Ignachi muthu .S, “Values for Life”, St.Paul Publications, Mumbai, 1994

**REFERENCE BOOKS:**

1. Frankena, W.K., “Ethics ”, Prentice Hall of India, New Delhi, 1990.
2. Meron Theodor,“Human Rights and International Law Legal Policy Issues”, Oxford University Press, First Edition, New Delhi, 2000.
3. Shukla .R.P, “Value Education and Human Rights, Sarup and Sons Publishing, New Delhi, 2004.
4. Yogesh Kumar Singh and Reschika Nath. “Value Education”. APH Publishing Corporation, New Delhi,2005.

| 19UME921 | ADVANCED I.C. ENGINES | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES :**

- To impart knowledge in engine combustion and engine design.
- To familiarize the students to understand the concepts of pollution formation, testing and recent developments in IC Engines.

| UNIT I | SPARK IGNITION ENGINES | 9 |
|---|---|---|

Carburetor, Mixture requirements, Design of carburetor –fuel jet size and venture size, Combustion in SI engines, Stages of combustion-normal and abnormal combustion, Factors affecting knock, Combustion chambers, Introduction to thermodynamic analysis of SI Engine combustion process.

| UNIT II | COMPRESSION IGNITION ENGINES | 9 |
|---|---|---|

Stages of combustion-normal and abnormal combustion – Factors affecting knock, Direct and Indirect injection systems, Combustion chambers, Turbo charging, Introduction to Thermodynamic Analysis of CI Engine Combustion process.

| UNIT III | DESIGN OF IC ENGINES | 9 |
|---|---|---|

IC engine design principles, Design of engine components - Piston, connecting rod, crankshaft, computer aided design of engine components, Combustion chamber designs for SI engine and CI engine.

| UNIT IV | POLLUTANT FORMATION IN ENGINES | 9 |
|---|---|---|

Formation of NOX , HC/CO mechanism , Smoke and Particulate emissions, Green House Effect, Methods of controlling emissions , and Particulate Trap, Emission (HC,CO, NO and NOX) measuring equipment's, Smoke and Particulate measurement, Indian Driving Cycles and emission norms.Noise pollution from automobiles, measurement and standards.

| UNIT V | TESTING OF IC ENGINES AND RECENT TRENDS IN IC ENGINES | 9 |
|---|---|---|

Torque measurement, Air flow measurement, Fuel flow measurement, Engine friction measurement, Speed measurement, Cylinder pressure measurement, Engine testing standards. Introduction to simulation tools. Adiabatic engines, Homogeneous Charge Compression Ignition Engine, Lean Burn Engine, Surface ignition and Stratified Charge Engine. Engines for special applications-mining, submarine, off road, race car, defense, Selective Catalytic Reduction (*SCR*).

**TOTAL :45 PERIODS**

**COURSE OUTCOMES:**

After successful completion of this course the students will be able to:

1. Explain combustion stages and pollution formation in SI and CI engines. (Understand).
2. Apply the concept of combustion process in SI and CI Engine and analyze the thermodynamic performance of an engine. (Apply)

3. Explain the engine testing standards, engine testing parameters measurement and various latest engines. (Understand)
4. Apply the Engine Exhaust emission control techniques to minimize various emissions. (Apply)
5. Design and analyze the I.C.engine components using software. (Analyze)
6. Analyze the performance of carburetor and find the air fuel ratio. (Analyze)

**TEXT BOOKS:**

1. Ganesan V, “Internal Combustion Engines”, Tata Mcgraw-Hill, 4th edition, 2012.
2. Heywood J. B, “Internal Combustion Engine Fundamentals”, McGraw Hill Book Co. NY, 1989
3. Mathur M. L and Sharma. R. P, “A Course in Internal Combustion Engines”, DharpatRai& Sons, 1993.

**REFERENCE BOOKS:**

1. John B Heywood, “Internal Combustion Engine Fundamentals”, Tata McGraw-Hill,
2. Gupta H.N, “Fundamentals of Internal Combustion Engines”, Prentice Hall of India, 2013.
3. Heinz Heisler, “Advanced Engine Technology”, SAE International Publications, USA, 2005.
4. Obert E. F, “Internal Combustion Engines and Air Pollution”, Harper and Row Publication Inc. NY, 1973.
5. Heisler H, “Advanced Engine Technology”, Edward Arnold, 1995.
6. Pundir B. P., “IC Engines Combustion and Emissions”, Narosa Publishing House, 2010.

| 19UME915 | REFRIGERATION AND AIR CONDITIONING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES :**

- To impart knowledge on various refrigeration cycles, system components and refrigerants.
- To impart knowledge on Psychrometry and Air conditioning Systems.

| UNIT I | REFRIGERATION CYCLE | 9 |
|---|---|---|

Thermodynamic principles of refrigeration – Vapour compression systems – Types of Vapour Compression Cycles, Use of ph charts, Cascade system, Basic air Refrigeration cycles.

| UNIT II | REFRIGERANTS AND SYSTEM COMPONENTS | 9 |
|---|---|---|

Compressors – reciprocating and rotary (elementary treatment), Types of condensers, evaporators, cooling towers – Functional aspects. Refrigerants – properties – selection of refrigerants, Alternate Refrigerants, Cycling controls.

| UNIT III | PSYCHROMETRY | 9 |
|---|---|---|

Psychrometric processes use of psychrometric charts – Grand and Room Sensible Heat Factors – bypass factor, requirements of comfort air conditioning, summer and Winter Air conditioning.

| UNIT IV | AIR CONDITIONING SYSTEMS | 9 |
|---|---|---|

Air Conditioning Systems – Summer Air Conditioning System, Winter Air Conditioning System – Factors affecting Air Conditioning Systems – Working principles of Comfort Air Conditioning System, Centralized Air conditioning systems, SplitAir conditioning systems. Indoor Air quality concepts.

| UNIT V | UNCONVENTIONAL REFRIGERATION CYCLES | 9 |
|---|---|---|

Vapour Absorption system – Ejector jet, Steam jet refrigeration, Thermo electric refrigeration. Applications – ice plant – food storage plants – milk – chilling plants.

**TOTAL : 45 PERIODS**

**COURSE OUTCOMES:**

After successful completion of this course the students will be able to:

1. Explain the working principle of refrigeration systems and cycle.
2. Summarize the system components and properties of refrigerants.
3. Apply the Psychrometric principles to solve problems.
4. Explain the working principles of Air conditioning systems.
5. Summarize the applications of Unconventional refrigeration cycles.

**TEXT BOOKS:**

1. Arora C.P, “Refrigeration and Air Conditioning”, Tata McGraw Hill, New Delhi, 2013.
2. Er. R.K. Rajput, “Refrigeration and Air Conditioning”, S.K. Kataria& Sons, 2012.

**REFERENCE BOOKS:**

1. Roy. J. Dossat, “Principles of Refrigeration”, Pearson Education, 2013.
2. Khurmi RS, “Refrigeration and Air Conditioning”, McGraw Hill Higher Education, 2010.
3. Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Ltd, 2005.
4. Stoecker N.F, Jones, “Refrigeration and Air Conditioning”, TMH,New Delhi, 2001.

| 15UCS913 | CYBER FORENSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**PRE-REQUISITE :**

**COURSE OBJECTIVES:**

- To know the principles and methods of computer forensics technology
- To learn different types of computer forensics system
- To introduce computer forensics services

| UNIT I | OVERVIEW OF COMPUTER FORENSICS TECHNOLOGY | 10 |
|---|---|---|

Introduction - Use of Computer Forensics in Law Enforcement - Assistance to Human Resources - Employment Proceedings - Services - Types of Computer Forensics Technology , Military Computer Forensic Technology -Types of Law Enforcement - Types of Business Computer Forensic Technology - Specialized Forensics Techniques – Specialized Forensics Techniques - Hidden Data and How to Find It - Spyware and Adware - Encryption Methods and Vulnerabilities - Protecting Data from Being Compromised - Internet Tracing Methods - Security and Wireless Technologies.

| UNIT II | TYPES OF COMPUTER FORENSICS SYSTEMS | 9 |
|---|---|---|

Internet Security Systems - Intrusion Detection Systems - Firewall Security Systems - Storage Area Network Security Systems - Network Disaster Recovery Systems - Public Key Infrastructure Systems - Wireless Network Security Systems - Satellite Encryption Security Systems - Instant Messaging (IM) Security Systems - Net Privacy Systems - Identity Management Security Systems - Identity Theft - Biometric Security Systems - Homeland Security Systems.

| UNIT III | VENDOR AND COMPUTER FORENSICS SERVICES | 8 |
|---|---|---|

Occurrence of Cyber Crime - Cyber Detectives - Fighting Cyber Crime with Risk-Management Techniques - Computer Forensics Investigative Services - Forensic Process Improvement.

| UNIT IV | COMPUTER FORENSICS EVIDENCE AND CAPTURE | 9 |
|---|---|---|

Data Recovery - Data Recovery Defined - Data Backup and Recovery - The Role of Backup in Data Recovery - The Data-Recovery Solution - Hiding and Recovering Hidden Data - Evidence Collection and Data Seizure - Collection Options – Obstacles - Types of Evidence - The Rules of Evidence - Volatile Evidence - General Procedure -Collection and Archiving - Methods of Collection – Artifacts.

| UNIT V | COMPUTER FORENSICS ANALYSIS | 9 |
|---|---|---|

Electronic Document Discovery: A Powerful New Litigation Tool - Identification of Data - Timekeeping - Forensic Identification and Analysis of Technical Surveillance Devices - Reconstructing Past Events - How to Become a Digital Detective - Useable and Unusable File Formats - Converting Files.

**TOTAL :45 Periods**

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Describe different types of computer forensics technologies. (Understand)
- Apply appropriate computer forensics system for the investigation of crime. (Apply)
- Employ suitable computer forensics services to identify cybercrimes. (Apply)
- Demonstrate various methods used for data recovery, evidence collection and data seizure in computer forensics. (Understand)
- Apply forensic analysis tools to recover evidence in computer crimes.(Apply)

**TEXT BOOK:**

1. John R. Vacca, “Computer Forensics”, Firewall Media, New Delhi,2009.

**REFERENCE BOOKS:**


1. Keith J. Jones, Richard Bejtlich, Curtis W. Rose, “Real Digital Forensics”, Addison Wesley Pearson Education, 2005.
2. Christopher L.T.Brown, “Computer Evidence - Collection & Preservation”, Firewall Media, Second Edition,2009
3. Jesus Mena, “Homeland Security - Techniques & Technologies”, Firewall Media, 2007.
4. Robert M.Slade, “Software Forensics Collecting Evidence from the scene of a Digital Crime”, Tata McGraw Hill, 2005.


| 19UCS920 | GREEN COMPUTING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**PRE-REQUISITE :**

**COURSE OBJECTIVES:**

- To study about green IT fundamentals and strategies.
- To learn environmentally responsible business strategies.

| UNIT I | FUNDAMENTALS | 9 |
|---|---|---|

Trends and reasons to go green: Overviews and issues-Current initiatives and standards - Organization planning for Green computing-Policies-metrics-The acorns diagram Consumption Issues: Minimizing power usage-Cooling-Going paperless-recycling-Hardware consideration.

| UNIT II | GREEN ASSETS AND MODELING | 9 |
|---|---|---|

Green Assets: Buildings, data centers, networks and devices – Green business process management: Modeling, optimization and collaboration – Green enterprise architecture – Environmental intelligence – Green supply chains – Green information systems: Design and development models.

| UNIT III | GRID FRAMEWORK | 9 |
|---|---|---|

Virtualizing of IT systems – Role of electric utilities, telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for green PC – Green data center – Green grid framework.

| UNIT IV | GREEN COMPLIANCE | 9 |
|---|---|---|

Socio-cultural aspects of green IT – Green enterprise transformation roadmap – Green Compliance: protocols, standards and audits – Emergent carbon issues: technologies and future.

| UNIT V | CASE STUDIES | 9 |
|---|---|---|

The Environmentally Responsible Business Strategies (ERBS) – Case study scenarios for trial runs – Case studies – Applying green IT strategies and applications to a home, hospital, packaging industry and telecom sector.

**TOTAL: 45 Periods**

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Apply the green computing strategies to an organization. (Apply)
- Apply various strategies to optimize the green assets of an enterprise. (Apply)
- Apply the techniques used to reduce the carbon footprint for a green data center. (Apply)
- Apply the green compliance and standards to go green. (Apply)
- Apply the Environmentally Responsible Business Strategies for real life scenarios. (Apply)

**TEXT BOOKS:**

1. Bhuvan Unhelkar, “Green IT Strategies and Applications - Using Environmental Intelligence”, CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

**REFERENCE BOOKS:**

1. Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff / IBM rebook, 2011.
2. John Lamb, “The Greening of IT”, Pearson Education, 2009.
3. Jason Harris, “Green Computing and Green IT- Best Practices on regulations & industry”, Lulu.com, 2008.
4. Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.
6. Toby J.Velte, Anthony T.Velte, Robert Elsen Peter, Green IT, McGrawHill, 2008.

| 19UCS919 | CYBER SECURITY | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

PRE-REQUISITE: Basic Knowledge of Computers, Networking and Internet and Windows Operating System.

COURSE OBJECTIVES :

The Student should be made to:

- The course has been designed to give students an extensive overview of cyber security issues, tools and techniques that are critical in solving problems in cyber security domains.
- To provide the concepts of computer security, cryptography, digital money, secure protocols, detection and other security techniques.
- Identify the various essential techniques, control mechanisms in protecting Information Systems, IT infrastructure, analysing and monitoring potential threats, attacks and implementing security solutions.
- Become Knowledgeable about the best practices related to cyber security, regulations and laws associated with the same.
- The students will also have a wider perspective to information security from national security perspective from both technology and legal perspective.

| UNIT I | INTRODUCTION TO CYBER SECURITY CONCEPTS | 9 |
|---|---|---|

Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security, Need for Information Security.

**Essential Terminologies:** CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning),Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

| UNIT II | CRYPTOGRAPHY AND CRYPTANALYSIS | 9 |
|---|---|---|

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPsec.

Open Source/ Free/ Trial Tools: Implementation of Cryptographic techniques, OpenSSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools).

| UNIT III | INFRASTRUCTURE AND NETWORK SECURITY | 9 |
|---|---|---|

Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.
Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain &abel, iptables/ Windows Firewall, snort, suricata, fail2ban.

| UNIT IV | CYBER LAWS AND FORENSICS | 9 |
|---|---|---|

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Sense, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations.
Open Source/ Free/ Trial Tools: Case Studies related to Cyber Law, Common Forensic Tools like dd, md5sum, sha1sum, Ram dump analysis, USB device

| UNIT V | SECURITY IN EVOLVING TECHNOLOGY | 9 |
|---|---|---|

Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.
Open Source/ Free/ Trial Tools: adb for android, xcode for ios, Implementation of REST/ SOAP web services and Security implementations.

**TOTAL:45 Periods**

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Identify common trade-offs and compromises that are made in the design and development process of Information Systems. (Apply)
- Apply the cryptographic operations of Symmetric cryptographic, public key cryptography algorithms, various authentication schemes to simulate different applications, security practices and System security standards.(Apply)
- Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real timescenarios
- Demonstrate the use of standards and apply the cyber laws to enhance information security in the development process and infrastructureprotection. (Apply)

- Illustrate how to apply different forensic analysis tools and methods used in Cyber Forensics.(Apply)
- Analyze and Implement the appropriate security technologies to protect computers and digitalinformation. (Analyze)

**TEXT BOOKS:**


1. William Stallings, “Cryptography and Network Security”, Pearson Education/PHI, 2006.
2. V.K. Jain, “Cryptography and Network Security”, Khanna Publishing House.
3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi.
4. Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security”, Pearson Education India.
5. AtulKahate, “Cryptography and Network Security”, McGraw Hill.


**REFERENCE BOOKS:**


1. V.K.Pachghare, “Cryptography and information Security”, PHI Learning Private Limited, Delhi India.
2. V.K. Jain, “Cryptography and Network Security”, Khanna Publishing House.
3. Nina Godbole, “Information System Security”, Wiley
4. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi.
5. Sarika Gupta &Gaurav Gupta, Information Security and Cyber Laws, Khanna Publishing House
6. AnshulKaushik, Cyber Security, Khanna Publishing House
7. Dr.Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, ”Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
8. Mike Chapple and David Seidl "Cyberwarfare: Information operations in a connected world" Jones & Bartlett Learning
9. CHANDER, HARISH, ”Cyber Laws And It Protection”, PHI Learning Private Limited, Delhi

| 19UEE909 | ENERGY AUDIT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

The objectives of the course are to make the students,

- To understand the energy scenario and concept of energy audit.
- To familiarize with energy management strategies in motors, lighting and HVAC systems.
- To choose the energy efficient motors, lightings and AC system for future use.
- To impart the knowledge on meters and instruments used in energy auditing.

| Unit I | ENERGY SCENARIO AND ENERGY AUDIT | 9 |
|---|---|---|

Importance of energy in economic development and social transformation - Indian energy scenario - Need for energy management - Role of Energy Managers in Industries – Energy monitoring, auditing & targeting – Economics of various Energy Conservation schemes. Energy conservation act - 2001 & its features - Energy Security.

| 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 | ENERGY MANAGEMENT IN LIGHTING SYSTEMS | 9 |
|---|---|---|

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

| Unit IV | ENERGY MANAGEMENT IN REFRIGERATION & AIR CONDITIONING | 9 |
|---|---|---|

Heat load estimation - Energy conservation in cooling towers & spray ponds – Case studies Energy efficiency and Energy balance – Energy conservation and opportunities in HVAC systems – Case studies.

| Unit V | INSTRUMENTS AND METERS IN ENERGY AUDIT | 9 |
|---|---|---|

Metering location vs. requirements - metering techniques and practical examples - Meters and Instruments used in energy audit: MD meter, Wattmeter, Multi-tasking solid state meters - Flue gas analyzers - PQ analyzers - Infrared thermography - Energy efficiency calculation in lighting and pumping applications - plant energy audit report**.**

**Total: 45 Periods**

**TEXT BOOKS:**

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006
2. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN-0-582-03184, 1990.
3. Albert Thumann,Terry Niehus A Handbook of Energy Audits, Ninth Edition, 2012.
4. Craig B. Smith,"Energy Management Principles", Pergamon Press, 2015.

**REFERENCE BOOKS:**

1. Charles E Brown, Springer, World Energy Resources, 2012.
2. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.
3. Reay D.A, Industrial Energy Conservation, 1st edition, Pergamon Press, 1977.
4. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
5. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
6. Electricity in buildings good practice guide, McGraw-Hill Education, 2016.
7. National Productivity Council Guide Books.

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Summarize, illustrate and explain the concepts of electric management and auditing. [**Understand**]
- Apply the knowledge of energy efficiency in the selection of motors, lightings and HVAC systems for industrial and domestic applications. [**Apply**]
- Analyze the importance of observing energy efficient measures and practices in electrical utility systems. [**Analyze**]
- Estimate the optimal sizing of refrigeration and air-conditioning systems with the consideration of energy conservation measures. [**Evaluate**]
- Analyze the suitable energy audit technique, procedure and bench marking in energy audit with the knowledge of various electrical equipment and metering. [**Analyze**]

| 19UEE910 | ELECTRICAL EQUIPMENT'S ERECTION,TESTING AND COMMISSIONING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

The objectives of the course are to make the students,

- To impart knowledge on installation, commissioning and testing of transformers, Synchronous machines, Induction machines and Earthing, Relays and Circuit Breakers.

| Unit I | INSTALLATION OF TRANSFORMERS | 9 |
|---|---|---|

Power and distribution transformers as per BIS standards- Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

| Unit II | COMMISSIONING AND TESTING OF TRANSFORMERS | 9 |
|---|---|---|

**Commissioning -** Volt ratio test, earth resistance, oil strength, Bucholz& other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test. **Testing -** Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal & abnormal conditions.

| Unit III | INSTALLATION, COMMISSIONING AND TESTING OF SYNCHRONOUS MACHINES | 9 |
|---|---|---|

**Installation:** Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

**Commissioning Tests:** Insulation, Resistance measurement of armature & field windings, Waveform & telephone interference tests, line charging capacitance.

**Performance tests:** Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient &sub transient parameters, temperature rise test, and retardation tests.

| Unit IV | INSTALLATION, COMMISSIONING AND TESTING OF INDUCTION MOTORS | 9 |
|---|---|---|

**Installation:** Location of the motors (including the foundation details) & its control apparatus, shaft& alignment for various coupling, fitting of pulleys & coupling, drying of windings.

**Commissioning Test:** Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations& balancing.

**Electrical Tests:** Insulation test, earth resistance, high voltage test, starting up, failure to speed upto take the load, type of test, routine test.

| Unit V | EARTHING, RELAYS AND CIRCUIT BREAKERS | 9 |
|---|---|---|

Reasons of earthing, earthing system, earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, double earthing, earth resistance measurement, rules for earthing.Testing and maintenance of Relays and Circuit Breakers - Testing of Relays Factory test, commissioning test and preventive periodic maintenance test. Testing of circuit breakers, voltage test, type test, preventive maintenance of circuit breaker.

**Total: 45 Periods**

**TEXT BOOKS:**

1. Testing & Commissioning Of Electrical Equipment -S. Rao,Khanna Publishers,2004
2. Testing & Commissioning Of Electrical Equipment -B .V. S. Rao, Media Promoters and Publication Pvt., Ltd.

**REFERENCE BOOKS:**

1. Relevant Bureau of Indian Standards
2. A Handbook on Operation and Maintenance of Transformers- H. N. S. Gowda, Publishedby H. N. S. Gowda,2006
3. Handbook of SwitchGears,BHEL, TMH,2005.
4. J and P Transformer Book, Elsevier Publication.
5. Rao, S., “Testing, commissioning, operation and maintenance of electrical equipment”, 6/E., Khanna Publishers, New Delhi
6. Paul Gill, “Electrical power equipment maintenance and testing”, CRC Press, 2008.
7. Singh Tarlok, "Installation, commissioning and maintenance of Electrical equipment", S.K. Kataria and Sons, New Delhi.

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Apply standards and code of practice for the installation of transformers. [Apply]
- Apply routine test procedures for proper commissioning of transformers and determine its performance. [Apply]
- Apply the procedures for installation, commissioning and testing of synchronous machines. [Apply]
- Apply the procedures for installation, commissioning and testing of induction motors. [Apply]
- Apply the procedures and standards for installation, commissioning and testing of earthing, switchgear & protective devices. [Apply]

| 19UEE971 | NON-CONVENTIONAL ENERGY RESOURCES AND APPLICATIONS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To explain concept of various forms of renewable energy
- To introduce the division aspects and utilization of renewable energy sources for both domestics and industrial applications
- To discuss the environmental and cost economics using renewable energy sources

| UNIT I | INTRODUCTION | 9 |
|---|---|---|

World energy use – Reserves of energy resources – Environmental aspects of energy utilization – Renewable energy scenario in India – Potentials – Achievements – Applications.

| UNIT II | SOLAR ENERGY | 9 |
|---|---|---|

Solar thermal – Flat plate and concentrating collectors – Solar heating and cooling techniques – Solar desalination – Solar cooker – Solar thermal power plant – Solar photo voltaic conversion – Solar cells – PV applications.

| UNIT III | WIND ENERGY | 9 |
|---|---|---|

Wind data and energy estimation – Types of wind energy systems – Performance – Details of wind turbine generator – Safety and Environmental Aspects.

| UNIT IV | BIOMASS ENERGY | 9 |
|---|---|---|

Biomass direct combustion – Biomass gasifier – Biogas plant – Ethanol production –Bio diesel – Cogeneration –Biomass applications.

| UNIT V | OTHER RENEWABLE ENERGY SOURCES | 9 |
|---|---|---|

Tidal energy – Wave energy – Open and closed OTEC Cycles – Small hydro – Geothermal energy – Fuel cell systems.

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Explain the Environmental aspects of energy utilization and Renewable energy scenario. [Understand]
- Illustrate the various applications of solar energy. [Understand]
- Discuss the concepts of types and performance of wind energy systems. [Understand]
- Analyze the processes of biomass. [Analyze]
- Analyze the process of other possible renewable energy sources. [Analyze]

**TEXT BOOKS:**

1. Rai G.D., “Non Conventional Energy Sources”, Khanna Publishers,1999.
2. Khan B.H., “ Non Conventional Energy Resources”, Tata McGraw Hill Publishing Company Ltd., 2006.

**REFERENCE BOOKS:**

1. Godfrey Boyle, “ Renewable Energy, Power for a Sustainable Future ”, Oxford UniversiPress, 1996.
2. Twidell J.W. and Weir, “Renewable Energy Sources ”, EFN Spon Ltd, 1996
3. Tiwari, “ Solar Energy – Fundamentals Design, Modelling and applications”,Narosa Publishing House, 2002.
4. Freris L.L., “ Wind Energy Conversion systems ”, Prentice Hall, 1990.
5. Sukhatme S.P., “ Solar Energy ”, Tata McGraw Hill Publishing Company Ltd., 1997.

| 19UEE973 | SOLAR POWER PLANTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES**

- To Explain Concept Of Various Power Cycles Involved In The Solar Power Plants
- To Outline The Variety Of Solar Systems Used To Collect Solar Energy
- To Summarize Basic Economics Of Solar Power Plants

| UNIT I | INTRODUCTION | 8 |
|---|---|---|

Power Plant Scenario - Classification, Basic Principles and Features - Comparison and selection Criteria.

| UNIT II | SOLAR POWER CYCLES | 9 |
|---|---|---|

Vapour cycles. Organic cycles. Combined cycles. Binary Cycles. Strilng and other cycles.

| UNIT III | SOLAR THERMAL POWER PLANTS | 10 |
|---|---|---|

Colector, Receiver, Energy Transfer Power cycles - Tower, Trough and Dish Systems – Concentrating Dish Systems - Concentrating Linear Fresnel Reflectors - Combined and Binary Cycles – Solar Chimneys - Hybrid Systems

| UNIT IV | SOLAR PV POWER PLANTS | 10 |
|---|---|---|

National / International PV Power Programmes - Photovoltaic Power Systems - System Integration - Energy Storage - Power Electronics - Stand-Alone Systems - Grid-Connected Systems - Concentrating Photovoltaic (CPV) - Electrical Performance

| UNIT V | ECONOMICS OF POWER PLANTS | 8 |
|---|---|---|

Methods of fixing power tariff - Simple Methods to Calculate the Plant Economy - Life Cycle Cost - Payback Period - Economic Analysis for the Selection of Alternative Decisions and the future of the Power Plants

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES**

After the successful completion of this course, the student will be able to

- Explain the operation and features of various power plants. [Understand]
- Analyze the various solar power cycles. [Analyze]
- Explain the various components and their functions used for solar thermal power plants. [Understand]
- Discuss the operation of standalone and Grid connected solar PV power plants. [Understand]
- Analyze the cost estimation and economic factors of power plants. [Analyze]

## REFERENCEBOOKS


1. Dufie, J.A., and Beckman, W.A. Solar Energy Thermal Process, John Wiley and Sons, New York, 2006.
2. Kosuke Kurokawa (Ed.), Energy from the Desert – Feasibility of very large scale photovoltaic power generation systems, James and James 2003.
3. Sukhatme S.P., Solar Energy, Tata McGraw Hils P Co., 3rd Edition, 2008.
4. C.J. Winter, R.L. Sizman, L.L. Vant-Hul, Solar Power Plants, Springer- Verlag Berlin and Heidelberg GmbH & Co. K, 201.
5. Tomas Markvart, Solar electricity, John Wiley & Sons, 2003.
6. Jorg Schlaich, The solar chimney: Electricity from the sun, Edition Axel Menges, 2005.
7. John McBrewster , Frederic P. Miler, Agnes F. Vandome (Eds.) Renewable Energy Commercialization, Alphascript Publishing 2009.


| 19UEE709 | RENEWABLE ENERGY LABORATORY | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |

**COURSE OBJECTIVES:**

- To train the students in Renewable Energy Sources and technologies.
- To provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- To recognize current and possible future role of Renewable energy sources.

**LIST OF EXPERIMENTS**

1. Simulation study on Solar PV Energy System.
2. Experiment on “VI-Characteristics and Efficiency of 1kWp Solar PV System”.
3. Experiment on “Shadowing effect & diode based solution in 1kWp Solar PV System”.
4. Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.
5. Simulation study on Wind Energy Generator.

6. Experiment on Performance assessment of micro Wind Energy Generator.
7. Simulation study on Hybrid (Solar-Wind) Power System.
8. Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
9. Experiment on Performance Assessment of 100W Fuel Cell.

**Total: 30 Periods**

**COURSE OUTCOMES**

After the successful completion of this course, the student will be able to

- Understand and analyze Renewable energy systems.
- Train the students in Renewable Energy Sources and technologies.
- Provide adequate inputs on a variety of issues in harnessing Renewable Energy.
- Simulate the various Renewable energy sources.
- Recognize current and possible future role of Renewable energy sources.

| 19UEE913 | SOLAR AND WIND ENERGY SYSTEMS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

The objectives of the course are to make the students,

- To study the current scenario of the implementation of Renewable energy conversion systems.
- To understand the solar radiation and its measurement techniques.
- To attain a broad comprehension on solar photovoltaic system and solar thermal energy conversion system.
- To learn the design and control principles of Wind turbine.

| Unit I | GLOBAL AND NATIONAL ENERGY SCENARIO | 9 |
|---|---|---|

World energy resources-Indian energy scenario- Importance of Renewable energy -Global solar resources, Solar in solation- -Radiation absorption, scattering - Measurement of Solar Radiation on horizontal and tilted surfaces Solar energy system, Measurement of radiation-Pyranometer-Pyrheliometer-Sunshine recorder.

| Unit II | SOLAR THERMAL ENERGY CONVERSION | 9 |
|---|---|---|

| | | |
|---|---|---|
| Solar thermal energy- Solar flate plate collector, Solar evacuated tube collector-Pool and Air collectors Construction -Function - Solar heating and cooling system - Real time issues in solar thermal systems-Comparison of solar thermal and Solar PV systems. | | |
| **Unit III** | **SOLAR PHOTOVOLTAIC SYSTEMS** | **9** |
| Introduction, Solar Cell Fundamentals, Solar Cell Characteristics, Solar Cell Classification, Solar Cell Technologies, Solar Cell, Module, and Array Construction, Maximizing the Solar PV Output and Load Matching. Maximum Power Point Tracker. Balance of System Components, Solar PV Systems, Solar PV Applications. | | |
| **Unit IV** | **WIND ENERGY CONVERSION SYSTEMS** | **9** |
| Wind source-wind statistics-Wind Energy Conversion System (WECS) siting-Classification-Components of WECS-WECS schemes-Power obtained from wind-simple momentum theory-Aerodynamics of Wind turbine. | | |
| **Unit V** | **WIND TURBINES** | **9** |
| HAWT - VAWT - Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations-Tip speed ratio-Number of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control-stall control-Schemes for maximum power extraction-wind Applications. | | |
| **Total: 45 Periods** | | |

**REFERENCE BOOKS:**


1. G.D.Rai, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 2011.
2. CS Solanki, Solar Photovotaics,Fundamentals, Technologies and Applications, 2nd edition, PHI Learning Pvt. Ltd., 2011.
3. Martin A. Green, Solar Cells Operating Principles, Technology, and System Applications PrenticeHall, 2008.
4. H.P. Garg and J. Prakash., Solar Energy,Fundamentals& Applications, Tata McGraw Hill book Co, New Delhi, 1997.
5. S.P. Sukhatme, J.K. Nayak, Solar Energy-Principle of thermal storage and collection, Tata McGraw Hill book Co, New Delhi, 2008.
6. G.N.Tiwari, Solar Energy-Fundamentals, Design,Modeling and Applications,Narosha Publishing House Ltd.,2002.
7. L.L.Freris,Wind Energy conversion Systems, Prentice Hall, 1990.
8. S.N.Bhadra, D.Kastha,S.Banerjee,Wind Electrical Sytems,Oxford University Press,2010.

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Explain the world, Indias energy resources along with solar radiation spectrum and measuring instruments for solar energy. [Understand]
- Classify the different types of solar thermal energy collectors. [Understand]
- Analyse the I-V characteristics of Solar PV System and MPPT algorithm. [Analyze]
- Analyze the performance of WECS and select a suitable site. [Analyze]
- Analyze the control mechanism for wind turbine. [Analyze]

| 19UEE928 | CONSUMER ELECTRONICS (Integrated Course) | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 2 | 3 |

**COURSE OBJECTIVES:**

- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
- To introduce the concept of microcontroller based system development.
- To introduce the concept of RISC and CISC microcontrollers.
- To study the architecture of PIC, R8C and MSP430 family microcontrollers

| Module I | Audio and Video System | 10 |
|---|---|---|

Microphone - Characteristics of Microphones - Gun Microphones - Wireless Microphones - Headphones and Headsets -Electrostatic Phones - Electret Electrostatic Headphones - Hearing Impairments - Hearing Aids - Ideal Loudspeaker - BasicLoudspeaker-LoudspeakerConstruction-Woofers-Midrange,ExtendedrangeandHighfrequencyLoudspeakers-Multispeakersystems-Baffles-Horns-StereoSystems.Monochrome-ColorTVstandards-TFT,Plasma,HDTV,LCD,LEDTV.

| **Module II** | **Recording and Reproduction** | **10** |
|---|---|---|
| Making the Record - Stereo Pickup Techniques - Stereo Recording Systems - Disc Equipment: Recording and PlaybackCharacteristics-StereoPickupheads-MagneticrecordingandPlayback-MagneticErasing-OpticalRecordingandReproduction, Mono, Stereo and Quad-Stereo Multiplexing - Equalisers and Mixers. | | |
| **Unit III** | **Domestic and Consumer Appliances** | **10** |
| Recording-Digital Computer - Public Address System - Speaker Matching Systems - Theater Sound System: Sound track, Types of sound film, Theater Sound Reproduction system, Working of a Projector, In Car Computers - Washing machines - Microwave ovens - Air-conditioners and Refrigerators - Airline Reservations – Remote controls Automated Teller Machines- Set top Boxes -Bar Codes–RFID. | | |
| | | **Total: 30 Periods** |

**List of Experiments (30 Periods)**

1. Test the performance of given microphone
2. Test the performance of given speaker
3. Test the output voltage and power of the Hi-Fi amplifier
4. Identify any three different faults by voltage analysis method for Hi-Fi audio amplifier
5. Select exact speed to write a CD for given type of data
6. Install/ Test the CD for given type of data
7. Measure voltage levels to sketch composite video signal at different stages of TV receiver
8. Use multimeter to measure voltage at various test points of colour TV receiver a) chroma section b) Picture tube
9. Use multimeter to test various test points at Horizontal section of colour TV receiver
10. Use multimeter to test voltage at various points of vertical section of the colour TV receiver
11. Test the various features of the given type of printer.

**Total: 60 Periods**

**TEXT BOOKS:**

1. Bali, Consumer Electronics, Pearson Education,1st Edition, 2005.
2. Philip Hoff, Consumer electronics for Engineers, Cambridge University Press,1st Edition, 1998.

| **REFERENCE BOOKS:** |
|---|
| 1. Sridhar Canumalla, Puligandla Viswanadham P.S.Bimbra, Portable Consumer Electronics: Packaging, Materials, and Reliability, Pennwell Books,1stEdition,2010.<br>2. DouglasKinney, A Beginners Guide to Consumer Electronics Repair: Hand Book and Tutorial, iUniverse, Inc,1stEdition, 2006.<br>3. Thomas M.Coughlin, Digital Storage in Consumer Electronics: The Essential Guide, ElsevierInc.,1st Edition,2008.<br>4. U.S.Consumer Electronics Industry in Review, Electronic Industries Association, Consumer Electronics Group, 1993. |
| |

**COURSE OUTCOMES:**

After the successful completion of this course, the student will be able to

- Describe the fundamental concepts, construction and working of Audio systems
- Analyze the recording and reproduction techniques of Audio Systems
- Describe the fundamental concepts, construction and working of Video systems
- Identify the problem and troubleshoot the consumer electronic products like TV, Washing Machines, Air Conditioners.
- Test the performance of various consumer electronics components.

| 19UAG908 | IoT APPLICATION IN AGRICULTURE ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

OBJECTIVES

- To understand the concept of IoT
- Understand how IoT technologies can be used in agriculture systems.
- Know the application of IoT in Agriculture.
- Understand how to collect and analyze data with IoT for precision agriculture systems.
- Application of AI in Agriculture Drones

.

UNIT I INTRODUCTION TO IOT IN AGRICULTURE 9

The internet of things for agriculture -crop management devices - soil monitors - devices are typically placed throughout fields -collect data -specific to crop farming.

UNIT II IOT BASED END-TO-END FARM MANAGEMENT SYSTEM 9

The internet of things for agriculture -crop management devices - soil monitors - devices are typically placed throughout fields -collect data -specific to crop farming.

UNIT III ENVIRONMENT CONTROL SYSTEMS 9

Artificial light systems, management of crop growth in greenhouses, simulation of $CO_2$ consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models ofplant production and expert systems in horticulture.

UNIT IV PRECISION FARMING 9

Precision agriculture and agricultural management – Ground based sensors, Remote sensing,GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

UNIT V CROP STRESS AND CONTROL 9

Assessment of plant greenness -photosynthetic active biomass-Crop stress-irrigationmanagement-Weed stress-Insect activity- pesticide control

TOTAL PERIODS: 45

**TEXTBOOK**

1. Sravanan. R. 2011. Information and communication technology for Agriculture and rural Development. New India Publishing Agency, New Delhi.

REFERENCE BOOK

1. FAO. 1998. Land and water Resources information Systems. FAO Land andWater Bulletin 7,Rome

2. ICFAI Business School (IBS) 2012. Information Technology and systems. IBS Center for Management Research, Hyderabad. Climate-Smart Agriculture- Source Book. 2013. Food and Agriculture Organization, Rome.

| **COURSE OUTCOMES**<br>At the end of the course student will be able to | | |
|---|---|---|
| **CO1** | Understand the IT and its application in natural resourcesmanagement | Understand |
| **CO2** | Know about internet application tools in farm management | Apply |
| **CO3** | Database management | Analysis |
| **CO4** | Design and application of farming support system | Design |
| **CO5** | Development of mobile apps and sensors in farm management | Modern Tool Usage |
| **CO6** | Get exposure on IoT technology for farm management | Individual and teammember |

| 19UAG503 | MICRO IRRIGATION SYSTEM | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES**

- To expose the students to the fundamental knowledge in Pumps for Irrigation use.
- Application of micro-irrigation in different land situations to introduce the concept of micro-irrigation and design a Sprinkler & Drip irrigation system.
- Design, planning and layout of the micro-irrigation systems for efficient/optimum management of water.
- Design and installation of sprinkler irrigation system
- Application of micro-irrigation in different land situations.

| **UNIT I WATER LIFTS AND PUMPS** | **9** |
|---|---|
| Pump classification Variable displacement pumps–Centrifugal pump- Submersible pump, Vertical Turbine pumps mixed flow – Jet and Airlift pumps-Pump selection and installation and troubles | |
| **Unit II PUMP VALVES AND MICRO IRRIGATION COMPONENTS** | **9** |
| Types of valves- Pressure relief valve- Gate valve-Isolated valve- Non return valve- Butterfly valve-Solenoid valves- Automated control valve- selection, repair and maintenance and components in micro Irrigation | |
| **Unit III DRIP IRRIGATION DESIGN** | **9** |
| Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams - Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters. | |
| UNIT **IV SPRINKLER IRRIGATION DESIGN** | **9** |
| Drip irrigation - Components - Dripper- types and equations governing flow through drippersWetting pattern- Chemigation application- Pump capacity-Installation- Operation and maintenance of Drip irrigation system. - Design of surface and sub-surface drip irrigation | |
| **Unit V Automation in Micro irrigation** | **9** |
| The Need for Automation of Irrigation- Merits and Demerits of Automation- Semiautomatic -Fully Automatic Systems of Automation - Automatic Controllers | |
| **TOTAL PERIODS : 45** | |

**TEXTBOOK**

1. Suresh, R., "Principles of Micro-Irrigation Engineering", Standard Publishers Distributors, New Delhi, 2010.
2. Michael, A.M., "Irrigation Theory and Practice", Vikas Publishers, New Delhi, 2002.

**REFERENCE BOOK**

1. Modi, P.N., and Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 1991.
2. Jack Keller and RondBelisher., "Sprinkler and Trickle Irrigation", Vannistrand Reinhold, New York, 1990.
3. Sivanappan R.K., "Sprinkler Irrigation", Oxford and IBH Publishing Co., New Delhi, 1987.
4. Keller.J and D. Karmeli, "Trickle Irrigation Design", Rainbird Sprinkler Irrigation Manufacturing Corporation, Glendora, California, USA.

**COURSE OUTCOMES**

At the end of the course student will be able to

| | | |
|---|---|---|
| **CO1** | Study the working principles of different valvesUnderstand the characteristics of different pumpsUnderstand types and components of micro-irrigation system | Remember/Understand |
| **CO2** | To acquaint the students about the components of micro irrigation systems, their design and lay out for efficient water, fertilizer and pesticides application | Apply |
| **CO3** | Analysis the Irrigation efficiency traditional and modern irrigation methods | Analysis |
| **CO4** | study the design parameters of drip irrigation system design<br>study the design parameters of sprinkler irrigation system design | Design |
| **CO5** | To gain knowledge about the hydraulics of sprinkler and drip irrigation. | Modern Tool Usage |
| **CO6** | Data collection and Benefit – cost analysis in micro irrigation systems | Individual and team member |

**15UCE972 AIR POLLUTION AND CONTROL ENGINEERING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

OBJECTIVES:

- To impart knowledge on the principle and design of control of Indoor/ particulate/gaseous air pollutant and its emerging trends.
- To give an overview of factors affecting selection of control equipment for particulate and gaseous contaminants.
- To teach the various control and preventive measures of noise pollution.

UNIT I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

UNIT V INDOOR AIR QUALITY MANAGEMENT 9

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures

TOTAL : 45 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Illustrate the various sources of air pollutants and their effects on human beings,materials and vegetation
- Evaluate the processes, approaches, and devices used to control air pollution
- Describe about the control of particulate and gaseous contaminants
- Describe the control and preventive measures of noise pollution
- Suggest effective measures for prevention and control of noise pollution.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004
2. Anjaneyulu. Y, „Air Pollution and Control Technologies", Allied Publishers (P) Ltd.,India2002.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak „Air Pollution", Lweis Publishers, 2000.
2. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, „Air Pollution Engineering Manual", John Wiley & Sons, Inc.,2000.
4. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 1995

| 15UCE910 | INDUSTRIAL WASTE MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To impart knowledge on sources and characteristics of various industrial wastes
- To give an awareness about the waste audit and its necessity
- To give an exposure on strategies for the prevention and control of industrial wastes

UNIT I INTRODUCTION 9

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II CLEANER PRODUCTION 9

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV TREATMENT TECHNOLOGIES 9

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatmentof industrial and municipal wastes – Residue management – Dewatering – Disposal

UNIT V HAZARDOUS WASTE MANAGEMENT 9

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills

TOTAL : 45 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Gain an insight into the pollution from major industries including the sources andcharacteristics of pollutants
- Carry out waste audit and plan minimization of industrial wastes
- Design facilities for the processing and reclamation of industrial waste water
- Select treatment technologies based on nature of wastes
- Manage Hazardous wastes by effective treatment methods

TEXTBOOKS:

1. Rao M. N. & Dutta A. K. , “Wastewater Treatment”, Oxford - IBH Publication, 1995.
2. Eckenfelder W.W. Jr., “Industrial Water Pollution Control”, McGraw Hill Book Company, New Delhi, 2000.
3. Patwardhan. A.D., Industrial Wastewater Treatment", Prentice Hall of India, NewDelhi 2010.

REFERENCES:

1. Shen T.T., “Industrial Pollution Prevention”, Springer, 1999.
2. Stephenson R.L . and Blackburn J.B., Jr., “Industrial Wastewater Systems Hand book”, Lewis Publisher, New York, 1998
3. Freeman H.M., “Industrial Pollution Prevention Hand Book”, McGraw Hill Inc., NewDelhi, 1995.
4. Bishop, P.L., “Pollution Prevention: Fundamental & Practice”, McGraw Hill, 2000.
5. Pandey, "Environmental Management" Vikas Publications, 2010.
6. Industrial Wastewater Management, Treatment and Disposal",(WEF - MOP - FD3)McGraw Hill, 2008.

| 15UCE931 | DISASTER MANAGEMENT AND MITIGATION | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To make them understand understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To provide a preliminary understanding of approaches of Disaster Risk Reduction(DRR)
- To create 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

Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster ( Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and RapidOnset Disasters(Air Crash, tidal waves, Tsunami) Risks.

UNIT II - IMPACTS OF DISASTERS 9

Impacts (including social, economic, political, environmental, health, psychosocial, etc.) Differential impacts : urban disasters, pandemics, complex emergencies, Climate change

UNIT III -APPROACHES TO DISASTER RISK REDUCTION 9

Disaster cycle - its analysis, 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.

UNIT IV - 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. Relevance of indigenous knowledge, appropriate technology and local resources

UNIT V- 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, DM Act and Policy, Other related policies, plans, programmes and legislation)

TOTAL : 45 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Differentiate different types of disasters.
- Explain the impacts of disasters on various aspects.
- Describe the approaches of Disaster Risk Reduction (DRR).

- Explain the inter-relationship between disasters and development projects.
- Explain the policies and plans related to disaster risk management in India.

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 IndiaEducation Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

REFERENCES:

1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012).
2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth. Belg;56:395-401
4. Sphere Project (2011). Humanitarian Charter and Minimum Standards in Disaster Response.
5. Satapathy S. (2009) Psychosocial care in Disaster management, A training of trainers manual (ToT), NIDM publication.
6. Prewitt Diaz, J.O (2004). The cycle of disasters: from Disaster Mental Health to Psychosocial Care. Disaster Mental Health in India, Eds: Prewitt Diaz, Murthy, Lakshmi Narayanan, Indian Red Cross Society Publication.
7. Sekar, K (2006). Psychosocial Support in Tsunami Disaster: NIMHANS responses.Disaster and Development, 1.1, pgs 141-154.
8. Geneva: Sphere Project. http://www.sphereproject.org/ handbook

**15UCE975 ENVIRONMENTAL SCIENCE AND ENGINEERING**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**OBJECTIVES:**

- To finding and implementing scientific, technological, economic and political solutionsto 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 integrated themes and biodiversity, natural resources, pollution controland waste management.

**UNIT I COMPONENTS OF ENVIRONMENT 9**

Components – Water, air and land – Inter-relationship between components – Subcomponents; Ecosystem - Structure and functional components of ecosystem - Development and evolution of ecosystem - Energy flow and material cycling in ecosystem - Natural and man made impacts on water, air and land; Environment and development - Concept of sustainable development.

**UNIT II SCIENCE OF ENVIRONMENT 9**

Chemistry, Physics and biology of water, air and land; Stress on the Chemistry, Physics and Biology of water, air and land owing to the impacts; Environmental quality objective and goals – Policies on development projects and their impacts, with emphasis on the branch of engineering of the student.

**UNIT III CURRENT ENVIRONMENTAL ISSUES 9**

Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Air pollution due to industries and vehicles; Global issues – Biodiversity, Climatic change, and Ozone layer depletion.

**UNIT IV ENGINEERING INTERVENTIONS TO REDUCE THE ENVIRONMENTAL STRESSES 9**

Minimisation of Stress - Principles of Physics, chemistry and biology in engineering interventions such as waste treatment - Flow sheets of engineering interventions relevant to the Engineering discipline of the student – Waste minimisation techniques – Clean technology options - Standards of performance of the interventions.

**UNIT V TOOLS FOR ENVIRONMENTAL MANAGEMENT 9**

Environmental impact assessment; Precautionary Principle and Polluter Pays Principle; Constitutional provisions, Legal and economic instruments in Environmental Management; Role of Non-government organisations – Community participation environmental management works; International conventions and protocols; Pollution Control Boards and Pollution Control Acts.

TOTAL : 45 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Describe the necessity of sustainable development
- Frame environmental quality policies for development projects and assess theirimpacts
- Realise the importance of current environmental issues
- Have an elaborate knowledge about techniques of waste minimisation
- Understand the social issues and various environmental acts.

TEXT BOOKS:

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, ThirdEdition, Pearson Education, Upper saddle River, New Jersey, 2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata Mc-Graw Hill, New Delhi,2006.

REFERENCES:

1. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Company, Belmont,California, 1996.
2. Anubha Kaushik, Kaushik C.P., “Environmental Science and Engineering”, Third Edition,New Age International, New Delhi, 2009.
3. De A.K., “Environmental Chemistry”, Wiley Eastern Ltd., New Delhi, 2001.
4. Trivedi R.K., Goel P.K., “Introduction to Air Pollution”, Techno-Science Publications,Jaipur, 1995.

| 15UCE861 | GREEN BUILDING CONCEPTS | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 |

OBJECTIVES:

- To understand the necessity of adopting the basic green building concepts

Introduction to Global Warming - Sources of global warming - Green buildings: Concepts - Rating – Rating by various agencies - Materials used and their Efficiency - Comparison of conventional & green buildings - Environment friendly and cost effective building technologies - Buildings with cost and energy efficient roofing systems - Building in different climatic regions

TOTAL : 15 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Adopt green building concepts in buildings

REFERENCES:

1. Jerry Yudelson,"The green building revolution", Island press, 2010.
2. Abe Kruger and Carl Seville, "Green building: principles and practices in residential construction", Cengage learning, 2012.

| 15UCE863 | WATER CONSERVATION TECHNIQUES | L | T | P | C |
|---|---|---|---|---|---|
| | | 1 | 0 | 0 | 1 |

OBJECTIVES:

- To emphasis the importance of ground water conservation

Need of planned utilization of water resources - economics of water resources utilization Water conservation - water harvesting - rainfall- run off relation - water storage in ponds, lakes, reservoirs and aquifers -selection of pond site - Embankment ponds- excavated ponds -Seepage control - methods-evaporation control-Recycling of harvested waterDrainage and Reclamation of water logged lands-sewage irrigation- conservation forestry-water shed management - groundwater recharge through wells - check dams and storage works – percolation pond.

TOTAL : 15 PERIODS

**COURSE OUTCOMES:**

After successful completion of this course, the students will be able to

- Adopt appropriate rainwater harvesting techniques

**REFERENCES :**

1. Santhosh Kumar Garg, Hydrology and water resources engineering, khanna publishers,Delhi.
2. G.L.Asawa,Irrigation and Water Resources Engineering ,New age international(p) ltd.,publishers, New Delhi.

| 19PGM801 | PEDAGOGY STUDIES | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 |

**OBJECTIVES :**

- To make the students understand a range of cognitive capacities in human learners
- To explain the outcome-based education system
- To describe the curriculum design process

| UNIT I | EDUCATIONAL PSYCHOLOGY AND ENGINEERING EDUCATION | 8 |
|---|---|---|

Learning process, motivation and engagement, ICT in learning and teaching, Facilitating the learners, Engineering education and recent trends, Research in Engineering education, General maxims of teaching, Teacher-centered, learner-centered and learning-centered approaches, Becoming a reflective teacher, Disruptive Innovation in Education

| UNIT II | OUTCOME BASED EDUCATION | 8 |
|---|---|---|

Outcome Based Education: A broad context for quality teaching and learning, planning for quality teaching and learning, Necessity for learning outcomes - Course Outcomes and Program Outcomes, Defining learning outcomes, learning outcomes in the cognitive domain, learning outcomes in the affective domain, learning outcomes in the psychomotor domain, Program Outcomes, Graduate Attributes, Program Educational Objectives, linking learning outcomes to teaching and assessment.

| UNIT III | CURRICULUM DESIGN | 7 |
|---|---|---|

Curriculum design cycle, curriculum structure, credit and academic load, need assessment – feedback from stakeholders, concept of “Constructive alignment”, the two loop approach of ABET, tuning approach of curriculum design, CDIO concept of curriculum design and implementation, Industry relevant curriculum design and implementation, concept mapping, Instructional design and delivery.

| UNIT IV | TEACHING AND ASSESSMENT STRATEGIES | 7 |
|---|---|---|

Direct instruction teaching strategy, co-operative learning, problem-solving, industry relevant teaching, role-play, case study, technology enabled teaching, research orientation, measurement and evaluation of students’ achievement, assessment of learning outcomes - assessment tools: direct and indirect assessment tools, rubrics for assessment, attainment analysis, corrective action- curriculum updation, improvement in pedagogy, innovative assessment methods

.

**TOTAL: 30 Periods**

**COURSE OUTCOMES:**

**After the successful completion of this course, the student will be able to**

- Develop pedagogical expertise through an introduction to theoretically-based teaching methods and strategies
- Write learning outcomes and link learning outcomes to appropriate assessments
- Design syllabus and lesson plans that align with learning outcomes
- Choose teaching-learning strategies appropriate to the needs of the learners

**REFERENCES:**


1. Dr.Sue Duchesne, Anne McMaugh, Sandra Bochner, Kerri-Lee Krause, “Educational Psychology for Learning and Teaching”, Cengage Learning, 4th Edition, 2019.
2. Lisa R. Lattuca, Patrick T. Terenzini, J. Fredericks Volkwein, and George D. Peterson, “The Changing Face of Engineering Education” The Bridge, National Academy of Engineering, Summer 2006.
3. Anderson, L. & Krathwohl , D. A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives . New York: Longman, 2001.
4. Blumberg, P. Developing learner-centred teaching: A practical guide for faculty. San Francisco: Jossey-Bass, 2017.
5. Teaching Support Services. Learning objectives. University of Guelph, Guelph, ntario. Retrieved from http://www.uoguelph.ca/tss/resources/idres/learningobjectives1.pdf
6. O.V. Boev, N.Gruenwald and G.Heitmann, “Engineering Curriculum Design aligned with Accrediation Standards”, Hochschule Wismar Publishers, 2013
7. Fink, D. L. Integrated course design. Manhattan, KS: The IDEA Center, 2005. Retrieved from http://www.theideacenter.org/sites/default/files/Idea_Paper_42.pdf


| 19PGM802 | ENGLISH FOR RESEARCH PAPER WRITING | L | T | P | C |
|---|---|---|---|---|---|
| | | 2 | 0 | 0 | 0 |

**OBJECTIVES :**

- To impart the knowledge of each section of the paper
- To give and exposure on writing skills and readability
- To enhance the student to write the good quality Research paper

| UNIT I | INTRODUCTION TO RESEARCH | 9 |
|---|---|---|

| | | |
|---|---|---|
| Introduction to Research Paper, Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs, Clarity and Removing Redundancy, Highlighting the Findings, Hedging and Criticising, Paraphrasing and Plagiarism - Useful idioms & phrases. | | |
| **UNIT II** | **STRUCTURE OF RESEARCH PAPER** | **6** |
| Types of the Research papers, Regular Research Paper - Review Research Paper – Case Study Research Paper – Research Letters - Sections of a Paper, Title, Author names and affiliations - Corresponding author - Abstracts, Keywords, Highlights, Graphical Abstract - Introduction, Methods, Results, Discussion, Conclusions, Acknowledgment - the First Draft. | | |
| **UNIT III** | **METHODOLOGY, RESULTS & DISCUSSION AND CONCLUSION** | **9** |
| Introduction – Writing preview of Research work – Review of literature – assimilating the points – Logical flow – Research gap - Writing the Methodology – Sequence - Specification – Explaining results – Interpretation and plotting – Discussion of the salient findings – Critical analysis – Writing the Conclusion | | |
| **UNIT IV** | **SUBMISSION OF RESEARCH PAPER** | **6** |
| Direct instruction as teaching strategy, co-operative learning, problem-solving, industry relevant teaching, role-play, case study, technology enabled teaching, research orientation, measurement and evaluation of students' achievement, assessment of learning outcomes - assessment tools: direct and indirect assessment tools, rubrics for assessment, attainment analysis, corrective action- curriculum updation, improvement in pedagogy, innovative assessment methods<br>.<br>**TOTAL: 30 Periods** | | |

**COURSE OUTCOMES:**

**After the successful completion of this course, the student will be able to**

- Write research paper effectively with improved standard of language
- Explain the different sections of the Research paper
- Formulate the Acceptable Research Manuscript

**REFERENCES:**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**ADDITIONAL READING**

1. MLA Handbook for Writers of Research Papers, The Modern Language Association of America, New York 2009

| 19PGM701 | RESEARCH METHODOLOGY AND IPR | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES :**

- To provide an overview on selection of research problem based on the Literature review
- To enhance knowledge on the Data collection and Analysis for Research design
- To outline the importance of ethical principles to be followed in Research work and IPR

| UNIT I | FORMULATION OF RESEARCH PROBLEM | 9 |
|---|---|---|

Meaning of research problem, Sources of research problem, Criteria- good research problem, and selecting a research problem, Scope and objectives of research problem. Defining and formulating the research problem - Necessity of defining the problem – Types of Literature Review- Sources for Literature Review - Identifying gap areas from literature review.

| UNIT II | RESEARCH DESIGN AND ETHICS | 9 |
|---|---|---|

Research Design – Different Research designs- Sampling design- Types of sampling, Methods of Data collection- primary data, secondary data
Plagiarism, Application of results and ethics - Environmental impacts - Ethical issues - ethical committees

| UNIT III | DATA ANALYSIS AND TESTING OF HYPOTHESES | |
|---|---|---|

Data Processing and Analysis strategies -Types of Analysis- Statistics in Research - Measures of Central Tendency - Measures of Dispersion - Measures of Asymmetry (Skewness) -Measures of Relationship - Simple Regression Analysis - Multiple Correlation and Regression
Testing of Hypotheses- Chi-square test, Taguchi and ANOVA

| UNIT IV | REPORT AND RESEARCH PROPOSAL WRITING | 9 |
|---|---|---|

Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports - Oral Presentation - Mechanics of Writing a Research Report - Bibliography, types of referencing, citations.
Format of research proposal -Research Proposal writing - assessment by a review committee.

| UNIT V | INTELLECTUAL PROPERTY AND PATENT RIGHTS | 9 |
|---|---|---|

Nature of Intellectual Property – Patents- Designs, Trade and Copyright- Geographical Indications. Process of Patenting and Development – Patent Search- Invention, Innovation-Documents for Patent filing - Examination- Grant of Patent. Scope of Patent Rights - Case Studies

Total: 45 Periods

**COURSE OUTCOMES:**

**After the successful completion of this course, the student will be able to**

- Analyze the literature to identify the research gap in the given area of research. (Analyze/Problem Analysis)
- Design suitable research methodology to pursue the research in scientific and systematic procedure with statistical / IT Tools.(Analyze/ Design & development of Solutions)
- Analyze and synthesize the data using research methods and knowledge to provide scientific interpretation and conclusion.(Analyze/Investigation)
- Prepare research reports and proposals by properly synthesizing, arranging the research documents to provide comprehensive technical and scientific report (organizing/Affective domain)
- Conduct patent database search in various countries for the research problem identified. (Analyze).
- Apply ethical principles in research and reporting to promote healthy scientific practice (Apply)

**REFERENCES:**


1. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
3. Wadehra, B.L. 2000. Law relating to patents, Trade Marks, Copy right designs and Geographical indications. Universal Law Publishing.
4. Carlos, C.M., 2000. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York.


**ADDITIONAL READING**

1. https://www.editage.com/insights/how-to-write-the-literature-review-of-your-research-paper
2. https://www.ee.iitb.ac.in/~apte/CV_PRA_TAGUCHI_INTRO.htm

| 19PCS509 | DIGITAL FORENSICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |

**OBJECTIVES :**

- Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

| UNIT I | DIGITAL FORENSICS SCIENCE AND COMPUTER CRIME | 9 |
|---|---|---|

**Digital Forensics Science:** Forensics science, computer forensics, and digital forensics.
**Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-

| | | |
|---|---|---|
| criminalistics area, holistic approach to cyber-forensics | | |
| **UNIT II** | **CYBER CRIME SCENE ANALYSIS** | **9** |
| **Cyber Crime Scene Analysis:** Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation. | | |
| **UNIT III** | **EVIDENCE MANAGEMENT & PRESENTATION** | **9** |
| **Evidence Management & Presentation:** Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause. | | |
| **UNIT IV** | **COMPUTER AND NETWORK FORENSICS** | **9** |
| **Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,<br>**Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data. | | |
| **UNIT V** | **MOBILE FORENSICS** | **9** |
| **Mobile Forensics:** mobile forensics techniques, mobile forensics tools.<br>**Legal Aspects of Digital Forensics**: IT Act 2000, amendment of IT Act 2008.<br>**Case study :** Recent trends in mobile forensic technique to seizure electronic evidence<br><br>**TOTAL: 45 Periods** | | |

**COURSE OUTCOMES:**

**After the successful completion of this course, the student will be able to**

- Interpret relevant legislation and codes of ethics
- Analyze Computer forensics and digital detective and various processes, policies and procedures
- Exemplify E-discovery, guidelines and standards, E-evidence, tools and environment.
- Examine mobile forensics techniques

**REFERENCES:**

1. John Sammons, The Basics of Digital Forensics, Elsevier
2. 2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

| 19PCS510 | BIOMETRICS | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **OBJECTIVES :** | | | | | |

- To Study the basics of Biometrics and its functionalities
- To Study the various Bio metric Technologies
- To expose the concept of Biometric Systems
- To outline the various measurements of Biometrics
- To learn to develop applications with biometric security

| | | |
|---|---|---|
| **UNIT I** | **INTRODUCTION** | **8** |

Introduction and Definitions of bio-metrics, Traditional authenticated methods and technologies.

| | | |
|---|---|---|
| **UNIT II** | **BIO-METRIC TECHNOLOGIES** | **10** |

**Bio-metric technologies:** Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palm print, On-Line Signature Verification, 3D Face Recognition, Dental Identification and DNA.

| | | |
|---|---|---|
| **UNIT III** | **USE OF BIO-METRIC SYSTEMS** | **8** |

The Law and the use of multi bio-metrics systems.

| | | |
|---|---|---|
| **UNIT IV** | **VARIOUS MEASUREMENTS OF BIOMETRICS** | **10** |

Statistical measurement of Bio-metric. Bio-metrics in Government Sector and Commercial Sector. Case studies of 3D face recognition and DNA matching.

| | | |
|---|---|---|
| **UNIT V** | **CASE STUDY** | **9** |

Case Studies of bio-metric system, Bio-metric Transaction. Bio-metric System Vulnerabilities.

**TOTAL: 45 Periods**

**COURSE OUTCOMES:**

**After the successful completion of this course, the student will be able to**

- Perform R&D on bio-metrics methods and systems.
- Classify the various modules constituting a bio-metric system.
- Familiarize with different bio-metric traits and to appreciate their relative significance.
- Evaluate and design security systems incorporating bio-metrics.
- Recognize the challenges and limitations associated with bio-metrics.

**REFERENCES:**


1. Biometrics for network security, Paul Reid, Hand book of Pearson
2. D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, Handbook of Fingerprint Recognition,Springer Verlag, 2003.
3. A. K. Jain, R. Bolle, S. Pankanti (Eds.), BIOMETRICS: Personal Identification in Networked Society, Kluwer Academic Publishers, 1999.
4. J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.), Biometric Systems: Technology,
5. Design and Performance Evaluation, Springer, 2004.
6. Anil Jain, Arun A. Ross, Karthik Nanda kumar, Introduction to biometric, Springer, 2011.
7. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K.Jain, D. Maltoni, and D. Maio