Open Elective Courses

Introduction

Choice Based Credit System (CBCS) is promoted in such a way that different open elective courses should be offered by every department to other departments. This interdisciplinary of learning open elective courses by other department students will have learning awareness and job oriented benefits. Students require the opportunity to choose any open elective course from different departments and apply their knowledge to acquire jobs in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

Advantages

- The CBCS offers the students to choose open elective courses of their own choice.
- They can also opt for an interdisciplinary approach to learn a subject.
- The students have more scope to enhance their skills and more scope of taking up case studies, projects and assignments, vocational training including entrepreneurship.
- It improves the job opportunities of students.
- It will help in enabling potential employers assess the performance of students on a scientific scale.

Procedure

Every student shall earn 3 credits by choosing one of the open elective courses from the following list. Further students from a particular program, for example Mining Engineering., shall not opt for open electives offered by their own program. Students shall

consult their class mentors before opting for an open elective course. The open elective courses on offer will be subject to availability of time table slot, faculty members, class rooms and minimum class strength specified from time to time.

Students may choose any one of the following courses.

Open Elective courses of 7th Semester

VII semester		
S. No	**Department**	**Open Elective Courses**
1	**Department of EEE**	Introduction to Electric Vehicles
2	**AMET Business School**	Sales Management
3	**Department of Naval Architecture and Offshore Engineering**	Introduction to Underwater Technology
4	**Department of Petroleum Engineering**	Petroleum Hazards and Risks
5	**Department of Information Technology**	Ethical Hacking and Cyber Security
6	**Department of Mathematics**	Logical deduction and Non-verbal reasoning
7	**Department of Mining Engineering**	Geospatial technology for Engineers
8	**Food Processing Technology**	Food Industry By-product Processing
9	**Department of Mechanical Engineering**	Alternate source of Energy
10	**Marine Biotechnology**	Ornamental Fish Culture
11	**Department of Physics**	Fundamentals of Lasers

<table>
<tr><td>PROGRAM</td><td colspan="5">Common to all the BE Programmes offered in AMET (ME, Mech, EEEM, PE, HE, NA &OE, Mining) and B.Tech FPT; BBA Shipping, B.Com., LCA</td></tr>
<tr><td>Course Code:

UEEEO11</td><td colspan="2">Introduction to Electric Vehicles</td><td>L
3</td><td>T
0</td><td>P
0</td><td>C
3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV Year / VII Semester</td><td colspan="4" rowspan="2">Contact hours per week

(3Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">NIL</td></tr>
<tr><td rowspan="3">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="3">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="3"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="3">Mandatory</td></tr>
<tr><td></td><td></td><td></td><td>√</td><td colspan="3"></td></tr>
<tr><td>Course Objective</td><td colspan="6">1. To present a comprehensive overview of Electric and Hybrid Electric Vehicles.
2. To introduce general aspects of advanced Electric and Hybrid Electric Vehicles.
3. To provide knowledge on modelling and implementation of HEV using Power Electronics concepts.</td></tr>
<tr><td>Course Outcome</td><td colspan="6">After the successful completion of the course, the students will be able to:

1. Infer the concepts of different configurations of electric vehicles.
2. Recognize of Electric Vehicle machineries.
3. Identify proper energy storage systems for vehicle applications.
4. Interpret the basic drive system of electric vehicles.
5. Comprehend the energy management strategies in Electric Vehicles.
6. Apply the concepts of Electric Vehicles.</td></tr>
</table>

UNIT I Introduction 9 Hrs

Basics of vehicle mechanisms, history of electric vehicles (EV) and hybrid electric vehicles (HEV), need and importance of EV and HEV, Power/Energy supply requirements.

UNIT II Electric Vehicle Machineries 9 Hrs

Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications, AC and DC Motor drives. Advanced permanent magnet and switch reluctance machines, configuration and control of drives.

UNIT III Energy Storage Systems **9 Hrs**

Requirements of Storage systems in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, comparison and characteristics.

UNIT IV Drives for Electric Vehicles **9 Hrs**

Basics of electric traction and hybrid traction systems, various EV/HEV drive-train topologies, power flow control in drive-train topologies. Modeling and analysis of EV/HEV drive train, sizing of motor, power electronics in HEV, various vehicle subsystems.

UNIT V Energy Management Strategies and Energy Efficiency **9 Hrs**

EV/HEV energy management strategies, classification and comparison of various energy management strategies, energy efficiency comparison for various EV and HEV variants.

TOTAL: 45 Hrs

TEXT BOOKS:

1. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

References

1. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. Chris MI, M. Abul and David WenzhongGao, "Hybrid Electrical Vehicle Principles and Application with Practical Perspectives", Wiley, 2nd Edition, 2017.
3. Wei Liu, "Introduction to Hybrid Vehicle System Modeling and Control", Wiley 1st Edition, 2013.

<table>
<tr><td>PROGRAM</td><td colspan="6">ABS UG – OPEN ELECTIVE</td></tr>
<tr><td>Course Code</td><td colspan="2">Course Name :
Sales Management</td><td>L
3</td><td>T
0</td><td>P
0</td><td>C
3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV (VII Semester)</td><td colspan="3" rowspan="2">Contact hours per week
(3 Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">NIL</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td colspan="2">Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td colspan="2">Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td colspan="2">✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="6">1. To understand the objectives of sales management
2. To learn the methods of selling of products
3. To understand the structure of sales department in an organization
4. To learn the physical distribution of products
5. To understand the appropriate channel of distribution of products</td></tr>
<tr><td>Course Outcome</td><td colspan="6">The Students will be able to
1. Learn the basics of sales and distribution management
2. Get to know about the selling process
3. Learn the need for sales organisation
4. Know the role of the physical distribution system
5. Learn to make appropriate channel management related decisions
6. Learn the techniques of sales promotion</td></tr>
</table>

Unit 1: Introduction: Sales Management

Nature, Scope, Objectives, functions and importance of Sales Management. Developing a Sales Organisation – its importance and functions. Formulation of Sales Strategy.(9 hours)

Unit 2: Managing the Sales Force:

Steps in designing and managing a Sales Force, functions and role of sales person and the sales manager, recruitment, selection and training of the sales force.(9 hours)

Unit 3: Personal Selling:

Nature, Scope, Importance, Significance and limitations of Personal Selling, Personal Selling as a career, basic steps in Personal Selling Process, methods of Approaching, Objections Handling.

(9 hours)

Unit 4: Sales Promotion:

Meaning and Significance of Sales Promotion, factors influencing Sales Promotion, Tools of Sales Promotion and Sales Promotion plan for new Products, factors affecting promotion mix.(9 hours)

Unit 5: Managing the distribution function:

Role of marketing intermediaries, factors influencing distribution channels, Impact of Online shopping.(9 hours)

TOTAL: 45 HOURS

TEXT BOOKS :

1. Sales Management-Still and Cundiff and Giovonni, Prentice Hall
2. Fundamentals of selling, Charles Futrell, McGraw Hill
3. Marketing Channels , Louis W Stern and Adel L Ansary, Thomson Publishing

REFERENCES :

1. Selling and sales management, Jobber, Prentice Hall
2. Professional Sales Management, Andersen R, McGraw Hill Education

<table>
<tr><td>PROGRAM</td><td colspan="5">COMMON TO ENGINEERING</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name :
ETHICAL HACKING AND CYBER SECURITY</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV YEAR (SEMESTER VII)</td><td colspan="3" rowspan="2">Contact hours per week
(3 Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">Nil</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td>✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="5">1. Expose the awareness of cyber security issues and challenges in IT environment
2. Learn the techniques needed for providing protection and security to our personal data and information resources
3. Develop awareness in taking precautions in protecting them from cyber crimes and fraudulent activities
4. Experiment and learn the skills to provide protection and security to organizational data and information to build a secured IT infrastructure</td></tr>
<tr><td>Course Outcome</td><td colspan="5">After completion of the course, the students will be able to
1. Understand the fundamentals of network security, security architecture and threats
2. Apply the different cryptographic operations of cryptographic algorithms
3. Identify vulnerability in IT System
4. Understand the malware infection and detection
5. Apply computer forensic analysis for investigation
6. Understand the cyber security regulation and standards</td></tr>
</table>

UNIT I INTRODUCTION TO CYBER SECURITY **9 Hours**

Overview of Cyber Security - Internet Governance - Challenges and Constraints - Cyber Threats - Cyber Crime - Cyber terrorism - Need for a Comprehensive Cyber Security Policy and International convention on Cyberspace

UNIT II CRYPTOGRAPHY AND NETWORK SECURITY **9 Hours**

Introduction to Cryptography - Symmetric key Cryptography - Asymmetric key Cryptography - Message Authentication - Digital Signatures - Applications of Cryptography - Overview of Firewalls - Types of Firewalls - User Management

UNIT III CYBER SECURITY VULNERABILITIES **9 Hours**

Overview of Cyber Security Vulnerabilities - Vulnerabilities in software - System administration - Complex Network Architectures - Open Access to Organizational Data - Weak Authentication - Unprotected Broadband communications - Poor Cyber Security Awareness

UNIT IV INTRUSION DETECTION AND PREVENTION **9 Hours**

Intrusion - Physical Theft - Abuse of Privileges - Unauthorized Access by Outsider - Malware infection - Intrusion detection and Prevention Techniques - Anti-Malware software - Network based Intrusion detection Systems and Prevention Systems

UNIT V CYBER FORENSICS AND LAWS **9 Hours**

Introduction to Cyber Forensics - Handling Preliminary Investigations - Conducting disk-based analysis - Scrutinizing E-mail - Validating E-mail header information - Tracing Internet access - Introduction to Cyber security regulations - Cyber security standards - case study.

TOTAL : 45 HOURS

TEXT BOOK:

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Sixth Edition, Pearson/Prentice- Hall, 2013.

REFERENCES:

1. Behrouz A. Forouzan, “Cryptography and Network Security”, McGraw Hill Education, Third Edition, 2015.
2. Bishop Matt, “Introduction to Computer Security”, Addison-Wesley, 2004.

Elective Course: **Logical deduction and Non-verbal reasoning**

Year :IV/ VII Sem

Course objectives:

1. To develop the logical reasoning in any kind of scenario.
2. To enable students to prepare for any kind interview and carrier developments.

Unit I **(9 hours)**

Problems: Logical reasoning-Statement regarding arguments-Statement regarding assumptions-Course of Action.

Unit II **(9 hours)**

Problems: Conclusions-conclusions from passages **-**Theme deductions-Questions and statements.

Unit III **(9 hours)**

Problems: Analogy-Series-Classification-mirror images and water images.

Unit IV **(9 hours)**

Problems: - Embedded figures – complete and incomplete pattern-Figure matrix- Rule Detections.

Unit V **(9 hours)**

Problems: Grouping of identical figures-Cube and dice- Dot situation-Figure formation and Analysis.

Text Books:

1. A Mordern approach to verbal and Nonverbal Reasoning-. R.S.Aggarwal -S.Chand, New Delhi-reprint 2007.

<table>
<tr><td>PROGRAM</td><td colspan="5">BE- Mining Engineering</td></tr>
<tr><td rowspan="2">Course Code:</td><td rowspan="2">Geospatial technology for Engineers</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV Year (VII SEMESTER)</td><td colspan="3" rowspan="2">Contact hours per week

(3Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">NIL</td></tr>
<tr><td rowspan="3">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td></td><td>✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="5">1. Define GIS and its implementation
2. Discuss digital data creation
3. Learning GIS related softwares.
4. Understanding the need of information of information technology for geospatial technology
5. Describe the engineering applications of GIS as a component to ERP system</td></tr>
<tr><td>Course Outcome</td><td colspan="5">At the end of the course the student will be able to:

1. Understand the various environmental terminologies
2. Apply the fire source & its prevention in mines
3. Analyze the natural air circulation process in subsurface
4. Understand the man-made methods deployed for air circulation in mines
5. Create the design procedure for mining ventilation
6. Understand the mine ventilation methods and its planning</td></tr>
</table>

UNIT I INTRODUCTION (9 Hrs)

Definition – Disaster, Hazard,Vulnerability, Resilience, Risks – Types of disasters - Earthquake, Landslide, Flood, Drought, Fire – Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) (9Hrs)

Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness of community based DRR, structural – non-structural measures, Roles and responsibilities of community, Panchayat Raj Institutions/Urban Local Bodies (PRI/ULB), Institutional Processes and Framework at State and Central level – State Disaster Management Authority (SDMA).

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT (9 Hrs)

Factors affecting Vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in Land-use – Impact of Climate change

UNIT IV DISASTER RISK MANAGEMENT IN INDIA (9 Hrs)

Hazard and Vulnerability profile of India, Components of Disaster relief – Water, Food, Sanitation, Shelter, Health, Waste management – Role of GIS and Information technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS (9 Hrs)

Landslide Hazard Zone - Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure – Drought Assessment - Case studies – Coastal Flooding – Storm Surge Assessment – Floods - Fluvial and Pluvial Flooding - Case studies – Health Disaster - Case studies – Man Made Disasters - Case studies.

Text Books

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

References:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

Name of the Subject: FOOD INDUSTRY BY PRODUCT PROCESSING

Subject Code	Contact Hours			Credit	Total Hours to Complete	Max Marks
	Lecture	Tutorial	Practical			
UCFPO09	3	0	0	3	45	100

OBJECTIVES

- To learn about the available byproducts and it's processing.
- To learn on effluent treatment with control measures on waste disposal.

UNIT I

Industrial By-products and Waste: Potentials and prospects of developing by-products industry in India.

UNIT II

Agricultural waste and agro based industrial waste management. By products of cereals. By products of legumes.

UNIT III

By products of oil seeds. By products of dairy. By products of fruit and vegetables processing industries.

UNIT IV

By products of meat, poultry and eggs and By- products of fish processing units.

UNIT V

By products of plantation crops and spices. Uses of by-products of agro based industries in various sector. Byproducts of fermentation industries. By- products of sugar and bakery industries.

OUTCOME

The basics and in depth knowledge on byproduct utilization and waste management**.**

REFERENCE BOOKS

1. Philip,A.C. Reconceptualizing quality. New Age International Publishers,Banglore. 2001.

2. Bhatia,R. and Ichhpujan,R.L. Quality assurance in Microbiology. CBS Publishers and

Distributors, New Delhi. 2004.

3. Kher, C.P. Quality control for the food industry. ITC Publishers, Geneva. 2000.

<table>
<tr><td>PROGRAM</td><td colspan="6">BE-Naval Architecture & Offshore Engineering</td></tr>
<tr><td rowspan="2">Course Code

UDNAO08</td><td colspan="2" rowspan="2">Introduction to Underwater Technology</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV Year (semester VII)</td><td colspan="3" rowspan="2">Contact hours per week

(3Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">NIL</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="3">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="3"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="3">Mandatory</td></tr>
<tr><td></td><td></td><td>✓</td><td colspan="3"></td></tr>
<tr><td>Course Objective</td><td colspan="6">This course provides basic knowledge about ocean, under water vehicles and under water operations.</td></tr>
<tr><td>Course Outcome</td><td colspan="6">After completion of the course, the students will be able to:

1. List the various challenges involved in the underwater exploration.
2. Impart the knowledge on underwater exploration.
3. Inspect the different pipeline methods and their installation with respect to subsea applications
4. Importance of different underwater vehicles and their operations
5. Develop the various sensors and navigation systems used for underwater applications
6. Build the knowledge on marine recourses and its explorations using latest technologies.</td></tr>
</table>

UNIT I – MARINE RESOURCES

Introduction, Challenges in deep sea, Seafloor characteristics, Physical properties of sea water. Effects of density, salinity and temperature on sound speed, Ocean resources, classification, potential uses of sea, Mineral and hydrocarbon resources

UNIT II – UNDERWATER EXPLORATION

Exploration, development, Underwater Sound Channels, Underwater instruments for positioning, signal transfer and mapping, production of hydrocarbons, deep sea mining – national developments

UNIT III – SUBSEA PIPELINE AND RISERS

Introduction subsea pipeline, Pipeline Elements, Piping material selection, Pipeline survey and mapping, Pipeline

route; Pipeline Installation Methods. Riser – different types of risers

UNIT IV – INTRODUCTION TO UNDERWATER VEHICLES

Introduction, Unmanned marine vehicles – Applications, Unmanned surface vehicles, Unmanned underwater vehicles – Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs), Classification, Types of ROV services, Operations, Type of propulsions, Design theory – Vehicle design and stability

UNIT V - UNDERWATER NAVIGATION & SENSING SYSTEMS

Vehicle sensors ; Function of sensors, Types of sensors, Sensor Categories Vehicle navigation sensors, Flux gate compass, Tether turn counter, Pressure-sensitive depth gauge, Obstacle avoidance sonar, Altimeter, Inclinometer, Vehicle lighting.

Total: 45 Hours

TEXTBOOKS:

1. G.Neumann& WJ Pierson, Jr., Principles of Physical Oceanography, Prentice Hall,1st edn.,1966.
2. 10. E S Cassdy, Introduction to Energy Resources, Technology and Society, Elsevier, 1st edn., 2000.
3. D S Cronon, Underwater Minerals, Academic Press, 1st edn., 1980.
4. Robert D. Christ and Robert L. Wernli, Sr. The ROV Manual - A User Guide for Remotely Operated Vehicles, 2nd ed. Elsevier, 2014

REFERENCES:

1. Borges & Ginsburg, Ocean Year Book (Vol 1 – 4), The University of Chicago Press, 1983.
2. Ghosh &Mukhopadyay, Mineral Wealth of the Ocean, Oxford & IBH Pub. Co., 2nd, 1999.

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E. Petroleum Engineering</td></tr>
<tr><td>Course Code

UDPEO07</td><td>Course Name :

Petroleum Hazards & Risk</td><td>L

3</td><td>T

0</td><td>P

0</td><td>C

3</td></tr>
<tr><td>Year and Semester</td><td>IV Year (VII Semester)</td><td colspan="4" rowspan="2">Contact hours per week

(4Hrs)</td></tr>
<tr><td>Prerequisite course</td><td>NIL</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td>✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="5">To understand the various hazards and environmental issues confronting the petroleum operations and remedial measures to be undertaken.</td></tr>
<tr><td rowspan="7">Course Outcome</td><td colspan="5">At the end of the course, Students will be able to</td></tr>
<tr><td>1</td><td colspan="4">Identify the Environmental impacts by the petroleum industry.</td></tr>
<tr><td>2</td><td colspan="4">Analyze the impact of drilling and production operations</td></tr>
<tr><td>3</td><td colspan="4">Explain the health effects & corrosion of petroleum hydrocarbons</td></tr>
<tr><td>4</td><td colspan="4">Identify the waste treatment and disposal methods for environmental protection</td></tr>
<tr><td>5</td><td colspan="4">Identify the waste management plans and also disposal processes for Environmental protection</td></tr>
<tr><td>6</td><td colspan="4">Identify the Hazard, Hazard evaluation and safety measures.</td></tr>
</table>

UNIT-I Introduction to environmental control in the petroleum industry (9Hrs)

Atmospheric Impacts; Aquatic Impacts; Terrestrial Impacts; Ecosystem Impacts; Potential Emergencies- Ozone depletion, GHG emissions, NOx and SOx emissions, SPM emissions etc**.** Case studies

UNIT-II The impact of drilling and production operations (9Hrs)

Measuring toxicity-Hydrocarbons- Salt- Heavy metals- Production chemicals- Drilling fluids- Produced water- Nuclear radiation- Air pollution- Acoustic impacts- Effects of offshore platforms- Risk assessment.Surface paths- Sub-surface paths- Atmospheric paths.

UNIT-III Environmental transport of petroleum wastes (9Hrs)

Toxicity, physiological, asphyxiation, respiratory, skin effect of petroleum hydrocarbons and their mixture- Sour gases with their threshold limits-Guidelines for occupational health monitoring in oil and gas industry. Corrosion in petroleum industry- Additives during acidizing, sand control and fracturing.

UNIT-IV Planning for environmental protection (9Hrs)

Environmental audits- Waste management plans- Waste management actions- Certification of disposal processes- Contingency plans- Employee training.

Waste treatment methods: Treatment of water- Treatment of solids-Treatment of air emissions

Waste disposal methods: Surface disposal- Subsurface disposal.

Remediation of contaminated sites: Site assessment- Remediation processes.

UNIT-V Hazard identification (9Hrs)

Hazard identification- Hazard evaluation- Hazop and what if reviews-Developing a safe process and safety management- Personal protection systems and measures.

Classification of fires- The fire triangle- Distinction between fires and explosions- Flammability characteristics of liquids and vapors- Well blow out fires and their control- Fire fight equipment-Suppression of hydrocarbons fires.

(Total 45 Hrs).

Text Books:

1. Srinivasan Chandrasekar, Health, safety & Environmental management in Offshore and Petroleum Engineering, 2016, Wiley Publication.
2. AlirezaBahadori, Hazardous Area classification in Petroleum &Chemical Plants, 2014,CRC Press-Taylor & Francis.

Reference Books:

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1. John C. Reis, Environmental Control in Petroleum Engineering, 1996, GulfPublishing Company.
2. Dennis P. Nolan,Application of HAZOP and What if Reviews to the Petroleum,Petrochemical and Chemical Process Industries, 1994,Noyes Publications.

<table>
<tr><td>PROGRAM</td><td colspan="6">BE-Mechanical Engineering</td></tr>
<tr><td rowspan="2">Course Code:

UDMCO07</td><td rowspan="2">ALTERNATIVE SOURCES OF ENERGY</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV Year (VII Semester)</td><td colspan="3" rowspan="2">Contact hours per week

(3Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2"></td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td>✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="6">1 To learn about commercial energy
2 To learn about solar energy
3 To understand about wind energy
4 To learn about bio-energy
5 To learn about ocean energy sources</td></tr>
<tr><td>Course Outcome</td><td colspan="6">1. After completing this course, the students will be able to apply the commercial energy
2. They will be able to know the significance of solar energy
3. The students will be able to analyze the wind energy
4. They will be able to apply the concept of bio-energy
5. They will be able to know the ocean thermal energy sources
6. The students will be able to apply the geo thermal energy concept.</td></tr>
</table>

UNITI COMMERCIALENERGY 9 Hours

Coal – Oil - Natural Gas - Nuclear power and Hydro - their utilization pattern in the past - present and future projections of consumption pattern - Sector-wise energy consumption – environmental impact of fossil fuels – Energy scenario in India – Growth of energy sector and its planning in India.

UNITII SOLARENERGY 9 Hours

Solar radiation at the earth's surface – solar radiation measurements –solar thermal flat plate collectors - concentrating collectors – solar thermal applications – heating – cooling – desalination - drying – cooking - etc – solar thermal electric power plant - principle of photovoltaic conversion of solar energy - types of solar cells - Photovoltaic applications: battery charger - domestic lighting - street lighting - water pumping etc

UNITIIIWINDENERGY 9Hours

Nature of the wind – power in the wind – factors influencing wind – wind data and energy estimation - wind speed monitoring - wind resource assessment - site selection - wind energy conversion devices – classification - characteristics, applications – offshore wind energy - Hybrid systems -safety and environmental aspects – wind energy potential and installation in India - Repowering concept.

UNITIV BIO-ENERGY 9 Hours

Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - direct combustion – biomass gasification - anaerobic digestion - types of biogas Plants - applications - alcohol production from biomass – bio diesel production – Urban waste to energy conversion - Biomass energy programme in India.

UNITV OTHER TYPESOFENERGY 9 Hours

Ocean energy resources - principle of ocean thermal energy conversion (OTEC) - ocean thermal power plants - ocean wave energy conversion - tidal energy conversion – small hydro - geothermal energy - geothermal power plants – hydrogen production and storage - Fuel cell – principle of working - various types - construction and applications.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Sukhatme, S.P., Solar Energy, Tata McGraw Hill,1984.

2. Renewable Energy,G.D.Rai.

3.Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd.,1986.

REFERENCE BOOKS:

1. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi,2009.
2. Peter Gevorkian, Sustainable Energy Systems Engineering, McGraw Hill,2007

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E.</td></tr>
<tr><td>Course Code

PDBTO09</td><td colspan="2">Ornamental Fish Culture</td><td>L
1</td><td>T
1</td><td>P
1</td><td>C
3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">IV year and VII Semester</td><td colspan="3" rowspan="2">Contact hours per week

(2 Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">Any under graduate degree with Engineering background</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td colspan="2">Professional Core</td><td colspan="2">Professional Elective</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td colspan="2">Open Elective</td><td colspan="2">Mandatory</td></tr>
<tr><td></td><td></td><td colspan="2">✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="6">• Rearing of both marine and freshwater ornamental fishes is a very simple yet commercially viable business.
• This paper would provide entrepreneurial avenues for the culturing of ornamental fishes through which graduates of any discipline may develop it as an entrepreneurial venture.</td></tr>
<tr><td rowspan="6">Course Outcome</td><td colspan="6">At the end of the course the student will be able to :</td></tr>
<tr><td>1.</td><td colspan="5">Outline the awareness on Ornamental Fish Culture.</td></tr>
<tr><td>2.</td><td colspan="5">List out the types and characteristics of ornamental fishes.</td></tr>
<tr><td>3.</td><td colspan="5">Compare the setting up of culture facility system.</td></tr>
<tr><td>4.</td><td colspan="5">List out the different types of feed and aquarium maintenance.</td></tr>
<tr><td>5.</td><td colspan="5">Summarize regarding the compost of solid wastes through microorganisms and earthworms.</td></tr>
</table>

Unit - I: Ornamental fish culture- an introduction

Introduction, Benefits of ornamental fish keeping as a hobby, Origin of keeping ornamental fishes as pets, International market, Major countries involved in ornamental fish trade, Major suppliers, Status of ornamental fish farming in India (domestic / national market)

Unit-II: Important Ornamental Fishes

Exotic ornamental fishes: guppy, molly, swordtail, platy, gold fish, koi carp, tiger barb, Siamese fighting fish, tetra, silver shark, angel, red-tailed black shark, red finned shark. Native ornamental fishes Honey gourami, rosy barb, zebra fish, glass fish, loach, etc.

Unit - III: Setting up of Culture facilities

Different types of ornamental fish culture facilities-cement cisterns, glass aquaria, earthen ponds, earthen pots; Water requirements; Aquarium equipments: Aerators, Air pumps, Filters etc.

Unit - IV: Feed and aquarium maintenance

Readymade feeds, Artemia cysts, other live feeds, daphnia tubifex, earthworms, bloodworms, mosquito larvae.

Unit - V: Aquarium Maintenance

Management of Water Quality Parameters; temperature and pH, disease prevention and control, Chemicals and medicines. Economics- Space and investment, manpower, maintenance.

TEXT BOOKS

1. Helen E. Roberts., Fundamentals of Ornamental fish health
2. Dey, V K (1997) *Hand Book on Aquafarming: Ornamental fishes.* Manual. MPEDA, Cochin.
3. Ramachandran, A., 1999. International Trade in Ornamental Fish. 12th Indian Seafood Trade Fair, Souvenir. Seafood Exporters Association, India. pp.24-29.
4. Singh, T. and Dey, V.K., 2003. Ornamental fish trade runs into billions, *Info fish Int.,* 5:54-60.
5. Thomas, K., 2008. Status of Ornamental fish trade in India with special reference to investment and trade opportunities. Abstract, International seminar on ornamental fish breeding, farming and trade, Cochin, India. pp.7.

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E, B.TECH,B.Com,B.B.A</td></tr>
<tr><td rowspan="2">Course Code:</td><td colspan="2" rowspan="2">Fundamentals of lasers</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">III, VII</td><td colspan="4" rowspan="2"></td></tr>
<tr><td>Prerequisite course</td><td colspan="2">Nil</td></tr>
<tr><td rowspan="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td>Professional Core</td><td colspan="3">Professional Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="3"></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td>Open Elective</td><td colspan="3">Mandatory</td></tr>
<tr><td></td><td></td><td>✓</td><td colspan="3"></td></tr>
<tr><td>Course Objective</td><td colspan="6">1. To Introduce concepts of light generation
2. To explain about different light sources
3. To demonstrate working of lasers and laser systems
4. To understand the applications of lasers
5. To demonstrate the working of holograms</td></tr>
<tr><td>Course Outcome</td><td colspan="6">After completion of the course, the students will be able
1. To understand the basic concepts of light
2. To demonstrate various light sources
3. To analyze different types of lasers.
4. To demonstrate the applications of lasers
5. To explain the working of a hologram and their applications
6. To summarize the basic understanding Laser system and their applications</td></tr>
</table>

UNIT-I Fundamentals of light energy **9 Hours**

Electromagnetic waves-properties of waves- properties of light-light emission, structure of atom, optical absorption, spontaneous emission, and stimulated emission

UNIT-IIOptical sources9 Hours

Monochromaticity, Coherence, Difference between laser and ordinary source, Broad band light sources and their applications in industry, population inversion, laser action, Gain of laser

UNIT-III Lasers 9 Hours

Main components of Laser-pumping, optical cavity, laser medium, types of laser medium, three and four level lasers, CW and pulsed lasers, Ruby laser

UNIT IVApplications of Lasers **9 Hours**

Eye surgery, cosmetic surgery, kidney stone treatment, precision measurements, printers, CD/DVD writing, weapon systems, material processing

UNIT -V Holography **9 Hours**

Interference-Diffraction-Recording of holograms-Reconstruction of holograms-application of holography in Non-destructive testing, data security, holographic communication

Total : 45 Hours

Text Books

1. AjoyGhatak and Thyagarajan, Lasers, Springer, 1-674

2. K.R. Nambiar, Lasers: Principles, Types and Applications, New age International Pvt Ltd, 1-285

References

1. W.T.Silfast, 2008, Laser fundamentals, Cambridge University press, 1-674