

## Open Elective Courses

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 Electrical and Electronics 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 5<sup>th</sup> Semester

V semester		
S. No	Department	Open Elective Courses
1	Department of EEE	Introduction to Robotics
2	AMET Business School	Basics of Entrepreneurship Development
3	Department of Naval Architecture and Offshore Engineering	Ocean Engineering
4	Department of Petroleum Engineering	Petroleum Refining Technology
5	Department of Information Technology	Web Design Fundamentals
6	Department of Mathematics	Mathematics for Competitive Exam-II
7	Department of Chemistry	Pollution and its Management
8	Department of Physics	Space Science
9	Department of Mining Engineering	Disaster Management
10	Food Processing Technology	Milk and Milk Products
11	Department of Mechanical Engineering	Engineering Instruments and Measurements
12	Marine Biotechnology	Biomaterials for Engineering Application

## Open Elective courses of 7<sup>th</sup> 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 Unwater 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

**STUDENT STRENGTH**

<b>S.NO</b>	<b>DEPARTMENT</b>	<b>III YEAR</b>	<b>IV YEAR</b>
1	Electrical and Electronics Engineering	24	47
2	Naval Architecture and Offshore Engineering	50	75
3	Petroleum Engineering	20	51
4	Mining Engineering	27	37
5	Food Processing Technology	12	23
6	Mechanical Engineering	71	70
7	AMET Business School	119	-
8	Maritime Commerce	14	-
9	Harbour Engineering	-	13
<b>Total Strength</b>		<b>337</b>	<b>316</b>

<b>PROGRAM</b>		ABS UG – OPEN ELECTIVE											
<b>Course Code</b>		<b>Course Name :</b> <b>Basics of Entrepreneurship Development</b>						<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>		
								3	0	0	3		
<b>Year and Semester</b>		III (V Semester)						<b>Contact hours per week</b>					
<b>Prerequisite course</b>		NIL						( 3Hrs )					
<b>Course category</b>		<b>Humanities and Social Sciences</b>			<b>Management courses</b>			<b>Professional Core</b>			<b>Professional Elective</b>		
		<b>Basic Science</b>			<b>Engineering Science</b>			<b>Open Elective</b>			<b>Mandatory</b>		
								✓					
<b>Course Objective</b>		<ol style="list-style-type: none"> <li>1. To learn the basics of entrepreneurship</li> <li>2. To study the different ways to become an entrepreneur</li> <li>3. To learn about project management</li> <li>4. To understand the financial analysis for business</li> <li>5. To understand the various marketing channels</li> </ol>											
<b>Course Outcome</b>		<p>The Students will be able to</p> <ol style="list-style-type: none"> <li>1. To know the basics of entrepreneurship</li> <li>2. Learn the process of setting up a new business together with problems to be faced</li> <li>3. Learn about project management</li> <li>4. Learn about financial analysis and sources of finance</li> <li>5. Get an idea about marketing channels</li> <li>6. Able to start the new business establishment</li> </ol>											
<b>Pos/COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>		
<b>CO1</b>	1	1	1	2	3	2	2	1	2	2	2		
<b>CO2</b>	2	1	2	3	3	2	2	1	2	2	2		
<b>CO3</b>	3	2	2	2	2	3	1	1	2	2	2		
<b>CO4</b>	3	1	2	1	2	1	1	1	2	2	2		
<b>CO5</b>	2	2	2	2	2	2	2	1	2	2	2		
<b>CO6</b>	1	1	1	3	2	3	2	1	2	2	2		
<b>Average</b>	2	1.3	1.7	2.2	2.3	2.2	1.7	1	2	2	2		
<b>Correlation Levels</b>		<b>1. Slight (Low)</b>				<b>2. Moderate (Medium)</b>			<b>3. Substantial (High)</b>				

### **UNIT – I Introduction to Entrepreneurship:**

Definition of Entrepreneur, Entrepreneurial Traits, and Entrepreneur vs. Manager, Entrepreneur vs. Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. (10 hours)

### **UNIT – II Creating and Starting the Venture**

Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.(8 hours)

### **UNIT – III The Business Plan**

Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities. (10 hours)

### **UNIT – IV New Venture Expansion Strategies and Issues**

Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits. (7 hours)

### **UNIT-V Institutional support to Entrepreneurship**

Role of Directorate of Industries, District Industries Centers (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Commercial banks Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).

(10 hours)

**Total 45 Hours**

### **TEXT BOOKS :**

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Publisher: Himalayan Book Company
2. Entrepreneur Development, Gupta & Srinivasan, Publisher: Pearson

### **REFERENCES:**

1. Entrepreneurship Development and Management, Dr. A.K. Singh, Publisher: Laxmi Publications
2. Entrepreneurial Development, S. S. Khanka, Publisher: S. Chand

<b>PROGRAM</b>		<b>COMMON TO ENGINEERING, MANAGEMENT AND COMMERCE</b>														
Course Code	Course Name : WEB DESIGN FUNDAMENTALS							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>					
								0	2	2	3					
Year and Semester	III YEAR ( SEMESTER V)							Contact hours per week (4 Hrs)								
Prerequisite course	Basic knowledge of HTML Tags															
Course category	Humanities and Social Sciences			Management courses				Professional Core				Professional Elective				
	Basic Science			Engineering Science				Open Elective				Mandatory				
									✓							
Course Objective	<ol style="list-style-type: none"> <li>1. Learn the basics of web concepts and HTML</li> <li>2. Be familiar to use the scripting languages – JavaScript</li> <li>3. Learn to develop XML and DTD documents</li> <li>4. Know the fuzzy control applications</li> <li>5. Learn genetic programming</li> </ol>															
Course Outcome	<p>After completion of the course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Apply solutions for static web page problem using HTML</li> <li>2. Design an interactive web page using CSS.</li> <li>3. Design a dynamic web page using Java script</li> <li>4. Implement a service side program in server</li> <li>5. Develop a well formed / valid XML document</li> <li>6. Apply a server side JSP and ASP scripting languages in real world applications</li> </ol>															
POS/COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	2	3	1	1	-	1	2	2	2	3	1	-	-	-	-	
CO2	3	2	2	2	1	3	2	3	2	1	1	-	-	-	-	
CO3	3	2	2	2	1	3	2	3	2	1	1	-	-	-	-	
CO4	2	1	3	3	2	2	-	2	1	3	2	-	-	-	-	
CO5	3	2	2	2	1	3	2	3	2	1	1	-	-	-	-	
CO6	2	3	1	1	-	1	2	2	2	3	1	-	-	-	-	
AVERAGE	2.5	2.1	1.8	1.8	1.2	2.1	2	2.5	1.8	2	1.1	-	-	-	-	
CORRELATION LEVELS			1.SLIGHT(LOW)				2.MODERATE(MEDIUM)				3.SUBSTANTIAL(HIGH)					

## **UNIT I INTRODUCTION TO HTML**

Introduction to World Wide Web - Basics of HTML - Tags and Attributes - Elements - Images and Hyperlink - Frames - Tables - Lists – Forms

## **UNIT II INTRODUCTION TO CASCADING STYLE SHEETS (CSS)**

Introduction to CSS - Creating Style Sheet - Properties - ID and Class - Styling: Background - Text Format - Controlling Fonts - Working with block elements and objects - Lists and Tables - Box Model

## **UNIT III BASICS OF JAVASCRIPT**

Introduction to JavaScript - Data types - Variables - Operators - Conditionals and Loops - Arrays - Functions - Built-in objects - Methods and Properties - Form validation – online registration page.

## **UNIT IV SERVER SIDE PROGRAMMING**

Introduction to XML - Attributes - Tags - Prolog - Namespace - Comments - Structure in Data - Elements - Naming Rules - DTD - DOM methods

## **UNIT V INTRODUCTION TO ASP AND JSP**

Basics of ASP - Working with ASP - Creating a simple ASP - Declaring variables and methods in pages - Script lets - Session and cookies – JSP – Overview - Lifecycle – Syntax - Directives - Implicit Objects, Application - Simple interactive web page – quiz application

**TUTORIAL: 30 HOURS**

## **EXPERIMENT LIST**

1. Design a page having suitable background color and text color with title “My First Web Page” using all the attributes of the Font tag.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register Number, Class] aligned in proper order using alignment attributes of Paragraph tag.
3. Write HTML code to design a page containing some text in a paragraph by giving suitable heading style.
4. Create a web page using Inline CSS
5. Create a web page using Embedded CSS

6. Create a web page using CSS BOX model
7. Write a java script program to perform arithmetic calculation
8. Create a web page using java script to validate user name and password
9. Create a java script interactive web page
10. Create a valid xml document for student information
11. Create an XML document with internal DTD
12. Create an xml document with external DTD
13. Create a simple web application using ASP
14. Write a JSP program to perform session tracking
15. Write a JSP program to implement quiz application

**PRACTICAL: 30 HOURS**

**TOTAL : 60 HOURS**

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#### **TEXT BOOKS**

1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web - How to program”, Pearson Education, Fourth Edition, 2012.

#### **REFERENCES**

1. Jennifer Niederst Robbins, “Learning Web Design”, O’Reilly fifth edition, 2018.
2. Jeffrey C Jackson, “Web Technology – A Computer Science perspective”, Pearson Education, 2007.





**AMET**  
ACADEMY OF MARITIME EDUCATION AND TRAINING  
DEEMED TO BE UNIVERSITY  
(Under Section 3 of UGC Act 1956)

**Elective Course:** **Mathematics for Competitive Exam -II**

**Year : III**

**Course objectives:**

1. To develop the skill of reasoning applied to numerical problems.
2. To enable students to prepare for competitive examinations.

**Unit I** **(9 hours)**

**Problems:** Decimal fractions-Square root and cube root-Ratio and proportions-Pipes and Cisterns

**Unit II** **(9 hours)**

**Problems:** Boats and Streams- Chain rule-Alligation or Mixture-Race and games of skill

**Unit III** **(9 hours)**

**Problems:** Clock- Stock& shares-True discount-Banker's discount problems.

**Unit IV** **(9 hours)**

**Problems:** Tabulation- Data analysis-Odd man odd& series\_Blood relation problems.

**Unit V** **(9 hours)**

**Problems:**Analogy-Logical venn diagrams-Direction sense test- logical sequence of words.

**Text Books:**

1. R.S.Aggarwal, (1989) Quantitative Aptitude. S.Chand, New Delhi, Chapter 7, 8, 27.
2. A Mordern approach to verbal and Nonverbal Reasoning-R.S.Aggarwal - S.Chand, New Delhi-reprint 2007.

**Web References:**

1. [www.2iim.com/india\\_mba\\_iim\\_cat.../quant\\_math.shtml](http://www.2iim.com/india_mba_iim_cat.../quant_math.shtml)
2. [www.onestopmba.com/cattips/materials/math/default.asp](http://www.onestopmba.com/cattips/materials/math/default.asp)

## **CHEMISTRY – POLLUTION AND ITS MANAGEMENT**

**Total contact Hours: 45**

**Prerequisite: Nil**

### **Course Objectives**

1. To learn the basic fundamental concepts in the field of water pollution
2. To know the standards and importance of water pollution
3. To study the various industrial effects and mitigation management
4. To learn the importance of methods of control of water pollution
5. To study the various water control act and functions of regulatory boards

### **UNIT I – SOURCES & CHARACTERISTICS OF WATER POLLUTION (9 Hrs)**

Water and wastewater pollution – Sources & Types of water and wastewater pollution – Physical, chemical and biological characteristics – Effects of water pollution. Drinking water - quality standards – WHO, ICMR, ICAR, Central and State quality control norms.

### **UNIT II – WATER QUALITY & TESTING PROCEDURES (9 Hrs)**

Quality of surface water – Water quality in flowing water, Water quality in impounded water, Ground water quality – Testing procedures of important water quality parameters (pH, Electrical Conductivity, Total Dissolved Solids, Calcium, Magnesium, Chloride, Sulfate, Sodium, Potassium, Dissolved Oxygen, Iron, Total Kjeldahl nitrogen, FRC, FAC).

### **UNIT III – INDUSTRIAL ACTIVITY & MITIGATION MEASURES (9 Hrs)**

Role of water in different industries – Effluent discharge characteristics – Discharge Standards for River and Streams – Role of stakeholders, public, NGOs, Government in Protection of Water bodies – Control measures – Industrial water contamination due to industries.

### **UNIT IV – WATER POLLUTION REGULATION (9 Hrs)**

Administrative regulations under recent legislations in water pollution control. Water (Prevention & Control of Pollution) Act 1974 and its Amendment Act 1988, Rules 1975, Cess Act 1977 and its Amendment Act 1991.

### **UNIT V – FUNCTIONS AND MANAGEMENT OF REGULATORY BOARDS(9 Hrs)**

Sustainable Development, Rain Water Harvesting – Methods – Water Pollution – Causes and Effects – Role of Regulatory bodies and Local bodies – CPCB – TWAD Board – CMWSSB etc. – Case studies related to Effective Water Management

### **REFERENCES**

1. Fair, G.M., Water and Wastewater engineering, Vol I & II, John Wiley and Sons, Newyork, 2010.
2. Metcalf & Eddy, Wastewater engineering, Treatment and Reuse, Tata MacGrawhill publications, 2008.

3. Aruna Venkat, Environmental law and policy, PHI learning private limited, New Delhi, 2011.

**Name of the course : Space Science**

**Course code :UDPHO 07**

**Category of course : Basic Science Course (BSc)**

**L: 3 T: 0 P: 0 C: 3**

**Course Objectives :**

Students will be able

1. To Introduce Space science.
2. To explain the formation of solar systems.
3. To relate Kepler's and Newton's laws to solar system.
4. To demonstrate formation of stars.
5. To describe origin of galaxies.
6. To apprise the creation of universe

**Course Outcome with knowledge levels:**

K2	To understand the basic concepts to Space.
K6	To discuss the laws of solar system.
K2	To demonstrate formation of stellar objects
K4	To analyze evolution and origin of galaxies.
K2	To demonstrate creation of Universe
K2	To summarize the basic laws of space science and formation of universe.

**Pre- requisite :**Higher Secondary School Education; Fundamental concepts of Physics

**Knowledge Levels as per Bloom Taxonomy:**

K1- Remember; K2- Understand; K3- Apply; K4- Analyse; K5- Evaluate; K6- Create

**Mapping of CO vs POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO <sub>1</sub>	1	1			3							3
CO <sub>2</sub>	3	2		1		2						2
CO <sub>3</sub>	2	2			1							3
CO <sub>4</sub>	2	1		2		3	2					2
CO <sub>5</sub>	1	3		3	2	1						1
CO <sub>6</sub>	1	1		1	1	1	3					3

CO <sub>7</sub>	3	2		2	2	3	1					2
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**Course contents:**

**Unit-I: Introduction 9 hours**

Introduction to space science and applications, **\*historical development.**

**Unit II: Solar System 9 hours**

Nebular theory of formation of our Solar System. Solar wind and nuclear reaction as the source of energy. **Sun and Planets:** Brief description about shape size, period of rotation about axis and period of revolution, distance of planets from sun, Bode's law, Kepler's Laws of planetary motion, Newton's deductions from Kepler's Laws, **\*Newton's Law of gravitation**, correction of Kepler's third law, determination of mass of earth, determination of mass of planets with respect to earth. Brief description of Asteroids, Satellites and Comets.

**Unit III: Star 9 hours**

Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation of elements. Classification of stars: Harvard classification system, Hertzsprung-Russel diagram, **\*Luminosity of star**, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit.

**Unit IV: Galaxies 9 hours**

Galaxies and their evolution and origin, **\*active galaxies** and quasars.

**Unit V: Creation of Universe 9 hours**

Early history of the universe, Big-Bang and Hubble expansion model of the universe, cosmic microwave background radiation, **\*dark matter and dark energy.**

**TOTAL: 45 PERIODS**

**\*Innovation**

Group discussion- video presentation – model making- power point presentation by students

**References:**

**i. Text Books:**

1. Bruce A. Campbell, Samuel Walter McCandless Jr., Introduction to Space Sciences and Spacecraft Applications, 1996, Gulf publishing Company, Houston, Texas, pp.1-254.
2. Brian Cox, Andrew Cohen, Wonders of the Solar System, 2010, Harper Collins Publishers, pp.1-256.

3. Carlos Jaschek, Mercedes Jaschek, 1990, *The Classification of Stars*, Cambridge University Press, pp.1- 413.
4. Venzo de Sabbata, *The Origin and Evolution of Galaxies*, 1982, World Scientific Publishing Co Pte Ltd, pp.1-222.

**ii. Reference Books:**

1. Jerry Sellers, 1994, *Understanding Space: An Introduction to Astronautics*, 3<sup>rd</sup> Edition, Learning Solutions; 2106.
2. C.D. Murray, S.F. Dermott, 2001, *Solar system Dynamics*, Cambridge University Press; 1 edition, pp. 1-596.
3. Joseph F. Baugher, 1985, *On Civilized Stars*, Prentice-Hall, pp.1-265.
4. [L. S. Sparke](#), [J. S. Gallagher](#) III, 2010, [Galaxies in the Universe: An Introduction](#), Cambridge University Press, pp. 1-444
5. P.C.W. Davies, 1982, *The Accidental Universe*, Cambridge University Press, Cambridge, pp. 1-152

PROGRAM		BE-Mining Engineering													
Course Code: UDMN510	Disaster management	L	T	P	C										
		3	0	0	3										
Year and Semester	III Year (v Semester)				Contact hours per week ( 3 Hrs )										
Prerequisite course	NIL														
Course category	Humanities and Social Sciences	Management courses		Professional Core				Professional Elective							
	Basic Science	Engineering Science		Open Elective				Mandatory							
Course Objective	<ol style="list-style-type: none"> <li>Understand the types of hazards</li> <li>Discuss the methods to prevent risk</li> <li>Describe the impacts of disaster on development</li> <li>Explain the contingency plan of disaster management</li> <li>Discuss the lessons learnt from various disasters</li> </ol>														
Course Outcome	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>To understand the disaster management</li> <li>Analyze the method of prevention</li> <li>Understand the impacts of disaster on development</li> <li>Understand contingency plan of disaster management</li> <li>Create the prevention chart for various disasters</li> <li>Understand the over all prevention and mitigation measures.</li> </ol>														
POS/ COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	1	-	2	2	3	-	-	2	3	2	2	1	1
CO2	3	2	2	1	2	-	2	-	-	-	2	3	1	2	1
CO3	-	-	2	-	-	-	2	-	-	2	2	2	2	2	2
CO4	-	-	-	-	-	2	2	-	-	-	3	2	2	1	1
CO5	-	-	2	1	2	3	2	-	-	2	2	2	2	1	1
CO6	2	1	2	1	2	3	2	-	-	2	3	2	2	2	2
Average	1.1	1.5	2.25	1	2	2	2.22	-	-	2	2.5	2.1	1.8	1.5	1.3
Correlation Levels				1.Slight(Low)				2.Moderate(Medium)				3.Substantial(High)			
<b>KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome: CO-Course Outcome :PSO-Programe Specific Outcome</b>															

## **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.

**(TOTAL: 45Hrs)**

## **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. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

## **References:**

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

Designed by “ Department of Mining Engineering

<b>PROGRAM CODE:UGA007</b>		<b>B.Tech Food Processing Technology</b>													
Course Code: <b>UDFPO04</b>	<b>Milk and Milk products Technology</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>				
								3	0	0	3				
Year and Semester	II Year (4 <sup>th</sup> Semester)							Contact hours per week ( 3Hrs )							
Prerequisite course	NIL														
Course category	<b>Humanities and Social Sciences</b>			<b>Management courses</b>				<b>Professional Core</b>				<b>Professional Elective</b>			
	<b>Basic Science</b>			<b>Engineering Science</b>				<b>Open Elective</b>				<b>Mandatory</b>			
								√							
Course Objective	<ol style="list-style-type: none"> <li>To discover the fundamental properties of milk and milk products</li> <li>To explain the Processing of Milk and Manufacture of dairy products Sanitation and effluent treatment in dairy industry</li> <li>To learn the basic nutritive value and importance of milk.</li> <li>To list various categorize of dairy products based on coagulation.</li> </ol>														
Course Outcome	<p>After completion of the course, the students will be able to</p> <ol style="list-style-type: none"> <li>Describe the importance of milk and their sources</li> <li>Summarize the basic processing aspects of milk processing</li> <li>Illustration of various processing SOP of dairy equipments</li> <li>Examine various dairy products based on coagulation, concentration and drying</li> <li>Define the various quality standards of dairy industry</li> <li>Define the sanitation, cleaning and effluent of dairy industry.</li> </ol>														
POS/COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	2	1	1	-	-	-	-	-	-	-	-
CO2	2	-	-	3	-	-	-	1	-	-	1	-	-	-	-
CO3	-	-	2	-	-	2	3	-	-	-	-	-	-	-	-
CO4	3	-	-	2	1	-	2	-	-	-	-	-	-	-	-
CO5	-	2	2	-	-	2	-	3	-	-	-	-	-	-	-
CO6	2	3	-	2	1	-	-	-	-	-	-	2	-	-	-
AVERAGE	2	2	1.5	1.5	1.2	2.2	2.3	2	-	-	1	2	-	-	-
CORRELATION LEVELS			1.SLIGHT(LOW)				2.MODERATE(MEDIUM)				3.SUBSTANTIAL(HIGH)				
<p><b>Unit I Properties Of Milk (9 hours)</b> Milk-Types-Introduction – Definition - Composition-Physical-Chemical and Thermal Properties-Heat Capacity, Density-Freezing-Boiling point.</p> <p><b>Unit II Processing And Quality Parameters Of Milk (9 hours)</b> Processing of Milk- Pasteurization, Milk-cream separation-Methods and Equipment's- packaging of</p>															



milk and milk products, judging and grading of milk

**Unit III Milk Products (9 hours)**

Traditional dairy products, Introduction of Yogurt, Cheese, Butter, Ghee, Ice-cream, malted products, evaporated milk products – Methods of processing and Equipment used.

**Unit IV Milk Powder Processing (9 hours)**

Processing of Milk Powder- Composition - Properties- methods of drying, substitutes for milk and milk products.

**Unit V Storage Sanitation And Effluent Treatment (9 hours)**

Storage of Milk in Tanks- cold storage - Milk and milk products storage Cleaning and Sanitation- Effluent – Effluent treatment plant

**Text Book**

1. Ananthakrishnan, C.P., and Sinha, N.N., “Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi. 1984.

2. Sukumar De., “Outlines of Dairy Technology”, Published by Oxford University press, New Delhi, 1991.

**References**

1. Warner, J.N., “Principles of Dairy Processing”, Wiley Eastern Pub. Co., New York, 1975.

2. Walstra, P. et al., “Dairy Technology : Principles of Milk Properties and Processes”. Marcel Dekker, 1999

3. Spreer, Edgar “Milk and Dairy Product Technology”. Marcel Dekker, 2005.

4. Tufail Ahmed., “Dairy Plant Engineering and Management”, Kitab Mahal Publishers, Allahabad, 1997.

<b>PROGRAM</b>	Applicable to all the BE Programmes offered in AMET													
<b>Course Code:</b>	Introduction to Robotics							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
UDEE004								3	0	0	3			
<b>Year and Semester</b>	III Year / V Semester							<b>Contact hours per week</b>						
<b>Prerequisite course</b>	NIL							( 3Hrs )						
<b>Course category</b>	<b>Humanities and Social Sciences</b>			<b>Management courses</b>				<b>Professional Core</b>			<b>Professional Elective</b>			
	<b>Basic Science</b>			<b>Engineering Science</b>				<b>Open Elective</b>			<b>Mandatory</b>			
								<b>v</b>						
<b>Course Objective</b>	<ul style="list-style-type: none"> <li>• To understand the basics of robotics</li> <li>• To learn electrical drives</li> <li>• To know different types of sensors for robot operations</li> <li>• To develop robots with links and effectors to achieve challenging tasks</li> <li>• To explore the broad scope of robotic applications</li> </ul>													
<b>Course Outcome</b>	<p>After completion of the course, the students will be able to</p> <ol style="list-style-type: none"> <li>1. Illustrate the fundamentals of Robotics</li> <li>2. Demonstrate the functions of basic components of a Robot</li> <li>3. Compare various types of Sensors</li> <li>4. Explain the principles of End Effectors</li> <li>5. Discuss safety and reliability</li> <li>6. Apply the knowledge of robotics in Engineering fields</li> </ol>													
	<b>POs / COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	
	<b>CO1</b>	3	2											
	<b>CO2</b>	3	2	3	2									
	<b>CO3</b>	3	3	2										
	<b>CO4</b>	3	2	2										
	<b>CO5</b>	3	3	2										
	<b>CO6</b>	3	3	3	2									
	<b>CORRELATION LEVELS</b>					<b>1. SLIGHT (LOW)</b>				<b>2. MODERATE (MEDIUM)</b>				

**Unit 1: INTRODUCTION****9 hours**

Robotics and basics of Robotics automation- Historical background-laws of Robotics-Robotics systems and Robot anatomy- classification of robots -Need for Robots.

**Unit 2: ROBOT DRIVE SYSTEMS****9 hours**

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors- Stepper Motors,-A.C. Servo Motors-Salient Features- Applications and Comparison of all Drives.

**Unit 3: SENSORS FOR ROBOTS****9 hours**

Requirements of a sensor, Principles and applications of various sensors- Position sensors – Piezo Electric Sensor, LVDT- Optical Encoders- Light Sensor- Ultrasonic Sensor, Smoke-Gas and Alcohol Sensor-Touch Sensor-Color Sensor-Humidity Sensor-Touch Sensors- Analog sensors and vision sensors.

**Unit 4: ROBOT AND END EFFECTORS****9 hours**

Introduction-classification of end effectors-Types of Grippers Hooks-scoops and other devices-Gripper force analysis and design of Drive system for gripper.

**Unit 5: APPLICATION OF ROBOTS****9 hours**

Implementation of Robots in Industries-Variou Steps- Safety Considerations for Robot Operations – Economic Analysis of Robots.

**Total hours:45hours****Text Books**

- 1.Klafter R.D., Chmielewski T.A and Negin M., “Robotic Engineering – An Integrated Approach”, Prentice Hall, 2003.
- 2.Groover M.P., “Industrial Robotics -Technology Programming and Applications”, McGraw Hill, 2001.

**References**

1. Francis N. Nagy, Andras Siegler, Engineering foundation of Robotics, Prentice Hall Inc., 1987
2. Richard D. Klafter, Thomas. A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Prentice Hall of India Pvt. Ltd., 1989
3. P.A. Janaki Raman, Robotics and Image Processing an Introduction, Tata Mc Graw Hill Publishing company

Ltd., 1995.

4. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
5. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
6. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
7. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.

<b>PROGRAM</b>	BE-Naval Architecture & Offshore Engineering					
<b>Course Code:</b> UDNAO03	Ocean Energy		<b>L</b> 3	<b>T</b> 0	<b>P</b> 0	<b>C</b> 3

<b>Year and Semester</b>	III Year ( semester V)		<b>Contact hours per week</b>			
<b>Prerequisite course</b>	NIL		( 3Hrs )			
<b>Course category</b>	<b>Humanities and Social Sciences</b>	<b>Managem nt courses</b>	<b>Professional Core</b>	<b>Professional Elective</b>		
	<b>Basic Science</b>	<b>Engineerin g Science</b>	<b>Open Elective</b>	<b>Mandatory</b>		
			✓			

**Course Objective** Students formulate the knowledge on variety of available ocean energy resources and statutory requirements.

**Course Outcome** After completion of the course, the students will be able to

1. State the available resources of ocean energy worldwide.
2. Apply the understanding of wave energy system design.
3. Describe the various design aspects of tidal and current energy system.
4. Formulate the necessity of thermal & osmotic energy system design.
5. Critique the various economics and policies of the state/country to support the ocean energy development.
6. Embark upon the understanding of ocean energy into the development of energy systems.

POS/C OS	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO1 2	PSO 1	PSO 2	PSO 3
CO1	13	22	--	11	11	--	11	11	12	1-	-1	--	-1	11	11
CO2	22	-1	33	11	-1	13	12	12	-1	33	--	--	-2	11	22
CO3	--	11	33	22	22	11	33	22	--	--	-1	--	--	-1	11
CO4	-1	-1	--	22	22	22	--	--	-1	22	--	33	-1	--	--
CO5	11	33	33	-2	22	22	--	22	22	22	22	22	--	-1	--
CO6	11	33	33	22	22	22	--	22	22	22	22	22	--	--	--
AVERAGE	1.3	2	2	1.8	1.6	1.6	1	1.5	1.3	1.5	1	1.16	0.6	0.6	0.66
CORRELATION LEVELS			1.SLIGHT(LOW)				2.MODERATE(MEDIUM)				3.SUBSTANTIAL(HIGH)				

### UNIT I – OCEAN ENERGY RESOURCES

Introduction to ocean environment – ocean circulation and stratification, ocean habitat, ocean economy; Various ocean energy resources worldwide; Site selection and characterization; Present development and future need; Energy routes.

### UNIT II – WAVE ENERGY

Ocean surface waves – wave measurements, wave theories, existing resources in India; System

working principle; Various design concept, design challenges; Case study – reliability of the design and lifespan.

### **UNIT III – TIDAL & CURRENT ENERGY**

Current measurements, current turbulence and energy resources; Existing resources in India, working principle; Various design concept, design challenges; Material selection; Case study – future requirement and any existing design.

### **UNIT IV – THERMAL & OSMOTIC ENERGY**

Introduction – Existing resources in India, working principle; Various design concept, design challenges; Case study – efficiency calculation of various system components.

### **UNIT V – ECONOMICS, POLICY AND ENVIRONMENT**

Basic economic analysis of ocean energy systems – cost and financing; Policy issues regarding ocean energy system in India – Socio-economic impact, licensing and permitting procedures; Environmental impact; Case study – any existing ocean energy system.

### **TEXT BOOKS:**

1. Sørensen, Bent. Renewable Energy, Second Edition. San Diego: Academic Press, 2000, 911 pp. ISBN 0-12-656152-4.
2. Vining, J., Muetze, G. A., Economic Factors and Incentives for Ocean Wave Energy Conversion.
3. Karimirad, Madjid, Offshore Energy Structures - For Wind Power, Wave Energy and Hybrid Marine Platforms, Springer International Publishing, Switzerland, 2014.
4. Markian M. W. Melnyk, Robert M. Andersen, Offshore Power: Building Renewable Energy Projects in U.S. Waters, PennWell Books, 2009.
5. Iea-Retd (Stichting Foundation Renewable), Offshore Renewable Energy: Accelerating the Deployment of Offshore Wind, Tidal, and Wave Technologies, Routledge, 2012.

### **REFERENCES:**

1. J W Twidell & A D Weir, Renewable Energy Resources, ELBS, 2006.
2. Vining, J., Muetze, G. A., Economic and Legal aspects of Ocean Wave Energy Conversion, EC 999: Advanced Independent Study Report, May 2006.
3. Bent Sorensen, Renewable Energy, Elsevier, Academic Press, 2011.
4. NPTEL lectures: Elements of Ocean Engineering (video): Web Address: <http://nptel.ac.in/syllabus/114105002/>

**Designed by**

“Department of Naval Architecture & Offshore Engineering”

<b>PROGRAM</b>		B.E. Petroleum Engineering															
<b>Course Code</b> UDPEO04		<b>Course Name :</b> Petroleum Refining Technology							<b>L</b>		<b>T</b>		<b>P</b>		<b>C</b>		
									3		0		0		3		
<b>Year and Semester</b>		III Year & V Semester							<b>Contact hours per week</b> (3Hrs )								
<b>Prerequisite course</b>		NIL															
<b>Course category</b>		Humanities and Social Sciences			Management courses				Professional Core			Professional Elective					
		Basic Science			Engineering Science				Open Elective			Mandatory					
									✓								
<b>Course Objective</b>		To gain comprehensive knowledge on oil refining and associated downstream processing activities and modern technologies involved in it.															
<b>Course Outcome</b>		At the end of the course, the Students will be able to															
		1	Classify the Distillation process in refinery by separation of crude into different petroleum products and testing the products with ASTM standards														
		2	Explain about the Secondary processing and its classification in the refineries.														
		3	Describe about Cracking of crude oil into other products and its importance in the refineries with its applications in petrochemical industries														
		4	Explain about the Unit process in petrochemical industries and its production techniques that will enhance the study of different petrochemicals.														
		5	Classify the Polymerization and its production methods in petroleum industries and its applications.														
		6	Describe the applications of petrochemical products														
<b>POS/ COS</b>	<b>PO 1</b>	<b>PO2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>POS 1</b>	<b>POS 2</b>	<b>POS 3</b>		
CO1																	
CO2																	
CO3																	
CO4																	
CO5																	
CO6																	
Average																	
<b>Correlation Levels</b>			1.Slight(Low)					2.Moderate(Medium)					3.Substantial(High)				
<b>KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programme Outcome:</b>																	
<b>CO-Course Outcome :PSO-Programme Specific Outcome</b>																	
<b>UNIT I – INTRODUCTION</b>														<b>(9Hrs)</b>			
Origin, exploration and production of Petroleum, Types of crudes, composition, characteristics, Products Pattern, Indigenous and imported crudes.Crude heating, primary distillation principles, separation of cuts, gaps / overlaps, stripping. Desalting heat balance in distillation, energy input and recovery, vacuum distillation, types of trays, draw offs, intermediate product, quality control.																	
<b>UNIT II- SECONDARY PROCESSING</b>														<b>(9 Hrs)</b>			

Lube oil and wax processing, solvent extraction, dewaxing desilting, deasphalting, clay contacting, principles operating parameters, feed and product equalities and yields. Types and functions of secondary processing, cracking, thermal cracking and visbreaking, different feed stocks, products, yields and qualities.

**UNIT III – CRACKING AND ITS TYPES**

**(9 Hrs)**

Fluid catalytic feed stocks and product yields and qualities. Catalyst and operating parameters. Steam Reforming, Hydrogen, Synthesis gas, cracking of gaseous and liquid feed stocks, olefins, Diolofins, Acetylene and Aromatics and their separation.

**UNIT IV- UNIT PROCESSES**

**(9 Hrs)**

Alkylation, oxidation, dehydrogenation, nitration, chlorination, sulphonation and Isomerization.

**UNIT V – POLYMERISATION**

**(9 Hrs)**

Models and Techniques, production of polyethylene, PVC, Polypropylene, SAN, ABS, SBR, Polyacrylonitrile, Polycarbonates, Polyurethanes, Nylon, PET

**(Total 45 Hrs).**

**Text Books**

1. B.K. Bhaskara Rao, “Modern Petroleum Refining Processes” Edition 3, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi, 2010.
2. William L. Leffler, “Petroleum Refining” fourth edition, 2008, Pennwell publishers.

**References**

1. Nelson W.L., “Petroleum Refinery Engineering”, McGraw Hill Publishing Company Limited, 1985
2. Watkins, R.N., “Petroleum Refinery Distillation, second edition, Gulf Publishing Company, Texas 1981
3. Groggins, “Unit Processing in Organic Synthesis” Edition 5, Tata McGraw Hill 1987

Designed by

“ Department of Petroleum Engineering”



<b>PROGRAM</b>		BE-Mechanical Engineering			
Course Code: UDMCO03	ENGINEERING INSTRUMENTS AND MEASUREMENTS	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3
Year and Semester	III Year (V Semester)	Contact hours per week ( 3Hrs )			
Prerequisite course	PHYSICS				
Course category	Humanities and Social Sciences	Management courses	Professional Core	Professional Elective	
	Basic Science	Engineering Science	Open Elective	Mandatory	
			✓		
Course Objective	<ol style="list-style-type: none"> <li>To learn about the measurement systems</li> <li>To learn about the parameter measurements</li> <li>To understand about linear and angular measurements</li> <li>To understand about the metrology of surfaces</li> <li>To learn about the advanced metrology</li> </ol>				
Course Outcome	<ol style="list-style-type: none"> <li>After completing this course, the students will be able to analyze the general concept of measurement systems</li> <li>They will be able to utilize the parameter measurements</li> <li>The students will be able to apply the linear and angular measurements</li> <li>They will be able to apply angular measurements</li> <li>The students will be able to analyze the metrology of surfaces</li> <li>They will be able to make use of advanced metrology</li> </ol>				
<b>UNIT I : MEASUREMENT SYSTEMS</b>		<b>9 Hrs</b>			
General concept - units and standards - characteristics of measuring instruments - sensitivity, stability, range, accuracy and precision - static and dynamic response - repeatability, hysteresis - systematic and random errors - correction, calibration – interchangeability					
<b>UNIT II : PARAMETER MEASUREMENTS</b>		<b>9 Hrs</b>			
Measurement of force, torque, power using mechanical, pneumatic, hydraulic, electrical instruments - flow measurement - rotameter, pitot tube - Temperature measurement - bimetallic strip, thermocouple, electrical resistance thermometer					
<b>UNIT III : LINEAR AND ANGULAR MEASUREMENTS</b>		<b>9 Hrs</b>			
Linear measuring instruments - vernier, micrometer, slip gauges, tool maker's microscope - interferometry, optical flats, comparators - mechanical, pneumatic, electrical applications - angular measurements - sine bar, sine center, bevel protractor, autocollimator					
<b>UNIT IV : METROLOGY OF SURFACES</b>		<b>9 Hrs</b>			
Fundamentals of GD & T - measurement of straightness, flatness and roundness - measurement of surface finish -					

Functionality of surfaces, parameters, comparative, stylus based and optical measurement techniques, filters-  
Introduction to 3D surface metrology.

**UNIT V : ADVANCED METROLOGY**

**9 Hrs**

Precision instruments based on laser - principles - laser interferometer - application in linear, angular measurements - machine tool metrology - Coordinate Measuring Machine (CMM) - constructional features - types, applications - digital devices - computer aided inspection - 3D scanning - machine vision systems

**TEXT BOOKS:**

1. Thomas G. Beckwith, Roy D, Marangoni, John H.Lienhard V., "Mechanical Measurements", 6th ed., Pearson Education India, 2014
2. Jain R.K., "Engineering Metrology", 20th ed, Khanna Publishers, 2009

**REFERENCES:**

1. Raghavendra N.V, Krishnamurthy L, "Engineering Metrology and Measurements", 1st ed., Oxford University Press, 2013
2. Gupta.I.C., "Engineering Metrology", 10th ed., Dhanpat Rai Publications, 2013
3. Anand K Bewoor, Vinay A Kulkarni, "Metrology & Measurement", McGraw Hill Education, 2009
4. Mahajan.M, "Engineering Metrology", Dhanapat Rai publications, 2014
5. Tayal A.K, "Instrumentation and Mechanical Measurements", 4th ed., Galgotia Publications, 2000

<b>PROGRAM</b>	B.E.														
<b>Course Code</b> <b>PDBTO04</b>	Course Name : <b>Biomaterials for Engineering Applications</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
									3	0	0	3			
<b>Year and Semester</b>	Mandatory course for EVEN SEMESTER								Contact hours per week (2 Hrs )						
<b>Prerequisite course</b>	Any Under Graduate degree with Engineering background														
<b>Course category</b>	<b>Humanities and Social Sciences</b>				<b>Management courses</b>				<b>Professional Core</b>				<b>Professional Elective</b>		
	<b>Basic Science</b>				<b>Engineering Science</b>				<b>Open Elective</b>				<b>Mandatory</b>		
									✓						
<b>Course Objective</b>	<ul style="list-style-type: none"> <li>Many of the biologically derived materials such as biosurfactants, biopolymers and biomaterials are widely used.</li> <li>Biomaterials used in Packaging, Constructions, paints, Oil and gas, agriculture/Forestry/Fishery, Electronics, Medical, Dental, and Pharmaceutical Applications.</li> <li>This course would provide overviews of Modern Biopolymers are used in Engineering.</li> </ul>														
<b>Course Outcome</b>	At the end of the course the student will be able to :														
	1.	Outline the process, properties and surface characterization of Biomaterials.													
	2.	List out the different types of biomaterials.													
	3.	Classification of biomaterials based on the industrial applications.													
	4.	Extend the knowledge of biomaterials in medical applications													
	5.	List out the new classes for biomaterials for novel applications.													
	6.	Summarize the applications of biomaterials in engineering.													
	<b>POS/ COS</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>
	CO1	1	2	1	1	2	1	1	-	-	-	-	-	-	-
	CO2	2	1	1	1	2	1	1	-	-	-	-	-	-	-
	CO3	1	1	1	1	1	1	1	-	-	-	-	-	-	-
	CO4	1	1	2	2	2	1	1	-	-	-	-	-	-	-
	CO5	2	2	1	2	2	2	2	-	-	-	-	-	-	-
	CO6	1	1	2	2	2	1	1	-	-	-	-	-	-	-
	<b>Average</b>	1.3	1.3	1.3	1.5	1.8	1.2	1.2	-	-	-	-	-	-	-
	<b>CORRELATION LEVELS</b>			1. SLIGHT (LOW)				2. MODERATE (MEDIUM)				3. SUBSTANTIAL (HIGH)			

### **UNIT 1- Introduction to Biomaterials**

Introduction to biomaterials engineering and processing - an overview- Properties of materials- Surface properties and surface characterization of materials.

### **UNIT 2- Types of Biomaterials**

Biomaterials Classifications- Bioinert materials- Bioactive materials- Bioresorbable materials and biomineralisation - Mechanisms and its uses.

### **UNIT 3- Biomaterials in Industrial Applications**

Classes of materials used in medicine: metals, polymers, FRPs, fabrics- Bioceramics- Hydrogel- Silicone biomaterials: history and chemistry- Medical fibers and biotextiles.

### **UNIT 4- Biomaterials in medical applications**

Design of materials for biomedical application: Cardiovascular medical devices- Tissue engineering scaffolds- Ophthalmologic applications- Bioelectrodes and biosensors- Burn dressing and skin substitutes- Sutures- Drug delivery systems (DDS).- Dental materials- Conventional acid-base cements.

### **UNIT 5- New Classes of Biomaterials for novel applications**

Applications in Nephrology- Applications in Ophthalmology- Applications in Orthopedics- Applications in Drug Delivery.

### **TEXT BOOKS**

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

### **REFERENCE BOOKS**

1. Biomaterials Science, An Introduction to Materials in medicine, Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996.
2. H.Boenig, Fundamentals of Plasma Chemistry and Tehnology, Technomic Publishing Co.Inc. Lancaster Basel, 1990.
3. K.C. Dee, D.A. Puleo and R. Bizios. An Introduction to Tissue-Biomaterial Interactions. Wiley 2002. ISBN: 0-471-25394-4.
4. T.S. Hin (Ed.) Engineering Materials for Biomedical Applications. World Scientific. 2004. ISBN 981-256-061-0.
5. Atala, A; Mooney, D. J. Eds Synthetic Biodegradable Polymer Scaffolds, Springer Verlag, New York,1997
6. Black, J.; Hastings, G. Handbook of Biomaterials Properties, Chapman/Hall, London.

<b>PROGRAM</b>	Common to all the BE Programmes offered in AMET															
<b>Course Code:</b> UDEE011	Introduction to Electric Vehicles								<b>L</b> 3	<b>T</b> 0	<b>P</b> 0	<b>C</b> 3				
<b>Year and Semester</b>	IV Year / VII Semester								<b>Contact hours per week</b> ( 3Hrs )							
<b>Prerequisite course</b>	NIL															
<b>Course category</b>	<b>Humanities and Social Sciences</b>				<b>Management courses</b>				<b>Professional Core</b>				<b>Professional Elective</b>			
	<b>Basic Science</b>				<b>Engineering Science</b>				<b>Open Elective</b>				<b>Mandatory</b>			
									<b>√</b>							
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To present a comprehensive overview of Electric and Hybrid Electric Vehicles.</li> <li>To introduce general aspects of advanced Electric and Hybrid Electric Vehicles.</li> <li>To provide knowledge on modelling and implementation of HEV using Power Electronics concepts.</li> </ol>															
<b>Course Outcome</b>	<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>Infer the concepts of different configurations of electric vehicles.</li> <li>Recognize of Electric Vehicle machineries.</li> <li>Identify proper energy storage systems for vehicle applications.</li> <li>Interpret the basic drive system of electric vehicles.</li> <li>Comprehend the energy management strategies in Electric Vehicles.</li> <li>Apply the concepts of energy Management in Electric Vehicles.</li> </ol>															
<b>POs / COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	
<b>CO1</b>	3	2	3	-	-	-										
<b>CO2</b>	3	3	3	3	-											
<b>CO3</b>	3	3	3	3	-											
<b>CO4</b>	3	3	3	1												
<b>CO5</b>	3	3	2	3												
<b>CO6</b>	3	3	2	2	3											
<b>AVERAGE</b>	<b>3.0</b>	<b>3.0</b>	<b>2.67</b>	<b>2.5</b>	<b>2.3</b>											
<b>CORRELATION LEVELS</b>			<b>1. SLIGHT (LOW)</b>					<b>2. MODERATE (MEDIUM)</b>					<b>3. SUBSTANTIAL (HIGH)</b>			
<b>UNIT I Introduction</b>															<b>9 Hrs</b>	
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.																
<b>UNIT II Electric Vehicle Machineries</b>															<b>9 Hrs</b>	
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.																
<b>UNIT III Energy Storage Systems</b>															<b>9 Hrs</b>	
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, 2<sup>nd</sup> Edition, 2017.
3. Wei Liu, "Introduction to Hybrid Vehicle System Modeling and Control", Wiley 1st Edition, 2013.

<b>PROGRAM</b>	ABS UG – OPEN ELECTIVE										
Course Code	Course Name : <b>Sales Management</b>							<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
								3	0	0	3
Year and Semester	IV (VII Semester)							Contact hours per week ( 3 Hrs )			
Prerequisite course	NIL										
Course category	<b>Humanities and Social Sciences</b>			<b>Management courses</b>			<b>Professional Core</b>		<b>Professional Elective</b>		
	<b>Basic Science</b>			<b>Engineering Science</b>			<b>Open Elective</b>		<b>Mandatory</b>		
							✓				
Course Objective	<ol style="list-style-type: none"> <li>To understand the objectives of sales management</li> <li>To learn the methods of selling of products</li> <li>To understand the structure of sales department in an organization</li> <li>To learn the physical distribution of products</li> <li>To understand the appropriate channel of distribution of products</li> </ol>										
Course Outcome	<p>The Students will be able to</p> <ol style="list-style-type: none"> <li>Learn the basics of sales and distribution management</li> <li>Get to know about the selling process</li> <li>Learn the need for sales organisation</li> <li>Know the role of the physical distribution system</li> <li>Learn to make appropriate channel management related decisions</li> <li>Learn the techniques of sales promotion</li> </ol>										
<b>Pos/COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>
<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO6</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Average</b>	<b>2.83</b>	<b>2.83</b>	<b>2.16</b>	<b>2.83</b>	<b>3</b>	<b>2.83</b>	<b>2.83</b>	<b>2.83</b>	<b>3</b>	<b>2.33</b>	<b>3</b>

Correlation Levels	1. Slight (Low)	2. Moderate (Medium)	3. Substantial (High)
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**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



<b>PROGR AM</b>		<b>COMMON TO ENGINEERING</b>																	
Course Code	Course Name : ETHICAL HACKING AND CYBER SECURITY								<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>							
									3	0	0	3							
Year and Semester	IV YEAR ( SEMESTER VII)								Contact hours per week (3 Hrs)										
Prerequisite course	Nil																		
Course category	Humanities and Social Sciences			Management courses			Professional Core			Professional Elective									
	Basic Science			Engineering Science			Open Elective			Mandatory									
							✓												
Course Objective	<ol style="list-style-type: none"> <li>Expose the awareness of cyber security issues and challenges in IT environment</li> <li>Learn the techniques needed for providing protection and security to our personal data and information resources</li> <li>Develop awareness in taking precautions in protecting them from cyber crimes and fraudulent activities</li> <li>Experiment and learn the skills to provide protection and security to organizational data and information to build a secured IT infrastructure</li> </ol>																		
Course Outcome	<p>After completion of the course, the students will be able to</p> <ol style="list-style-type: none"> <li>Understand the fundamentals of network security, security architecture and threats</li> <li>Apply the different cryptographic operations of cryptographic algorithms</li> <li>Identify vulnerability in IT System</li> <li>Understand the malware infection and detection</li> <li>Apply computer forensic analysis for investigation</li> <li>Understand the cyber security regulation and standards</li> </ol>																		
PO S/COS	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	SO1	SO2	SO3				
1 CO																			
2 CO																			
3 CO																			
4 CO																			
5 CO																			
6 CO																			
AV ERAGE		.3	.5	.5															
CORRELATION LEVELS			1.SLIGHT(LOW)					2.MODERATE(MEDIUM)					3.SUBSTANTIAL(HIGH)						

**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**

**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 Modern approach to verbal and Nonverbal Reasoning-. R.S.Aggarwal -S.Chand, New Delhi-reprint 2007.

PROGRAM		BE- Mining Engineering															
Course Code:		<b>Geospatial technology for Engineers</b>						L	T	P	C						
								3	0	0	3						
Year and Semester		IV Year (VII SEMESTER)						Contact hours per week ( 3Hrs )									
Prerequisite course		NIL															
Course category		Humanities and Social Sciences			Management courses			Professional Core			Professional Elective						
		Basic Science			Engineering Science			Open Elective			Mandatory						
								✓									
Course Objective		<ol style="list-style-type: none"> <li>1. Define GIS and its implementation</li> <li>2. Discuss digital data creation</li> <li>3. Learning GIS related softwares.</li> <li>4. Understanding the need of information of information technology for geospatial technology</li> <li>5. Describe the engineering applications of GIS as a component to ERP system</li> </ol>															
Course Outcome		<p>At the end of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the various environmental terminologies</li> <li>2. Apply the fire source &amp; its prevention in mines</li> <li>3. Analyze the natural air circulation process in subsurface</li> <li>4. Understand the man-made methods deployed for air circulation in mines</li> <li>5. Create the design procedure for mining ventilation</li> <li>6. Understand the mine ventilation methods and its planning</li> </ol>															
OS/OS	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	SO1	SO2	SO3		
O1																	
O2																	
O3																	
O4																	
O5																	
O6																	
verage	.1	.5	.25				.22				.5	.1	.8	.5	.3		
Correlation Levels				1.Slight(Low)				2.Moderate(Medium)				3.Substantial(High)					

**KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programme Outcome:**  
**CO-Course Outcome :PSO-Programme Specific Outcome**

### **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.

**Designed by** “ Department of Mining Engineering”

**Name of the Subject: FOOD INDUSTRY BY PRODUCT PROCESSING**

<b>Subject Code</b>	<b>Contact Hours</b>			<b>Credit</b>	<b>Total Hours to Complete</b>	<b>Max Marks</b>
	<b>Lecture</b>	<b>Tutorial</b>	<b>Practical</b>			
<b>UCFPO09</b>	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.

PROGRAM		BE-Naval Architecture & Offshore Engineering															
Course Code		Introduction to Underwater Technology							L	T	P	C					
UDNAO08									3	0	0	3					
Year and Semester		IV Year (semester VII)							Contact hours per week (3Hrs)								
Prerequisite course		NIL															
Course category		Humanities and Social Sciences			Management courses				Professional Core				Professional Elective				
		Basic Science			Engineering Science				Open Elective				Mandatory				
Course Objective		<ol style="list-style-type: none"> <li>Obtaining a basic knowledge on different underwater technologies</li> <li>Knowing the techniques for exploration, subsea pipeline and underwater vehicles</li> <li>Getting familiar with underwater vehicles and its operations</li> </ol>															
Course Outcome		<p>After completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> <li>Recognize various challenges involved in the underwater exploration</li> <li>Discuss the importance of ocean resources</li> <li>Explain the national developments in underwater exploration of resources</li> <li>Understand different pipeline methods and their installation with respect to subsea applications</li> <li>Classify different underwater vehicles and their operations</li> <li>Identify various sensors and navigation systems used for underwater applications</li> </ol>															
POS/COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
CO1	2	1	-	1	1	1	1	-	1	1	1	-	1	2	2		
CO2	2	1	-	1	1	1	1	-	1	1	1	-	1	2	2		
CO3	2	1	-	1	1	1	1	-	1	1	1	-	1	2	2		
CO4	2	1	-	1	1	1	-	-	1	1	1	-	1	2	2		
CO5	2	2	-	2	1	1	-	-	2	2	2	-	1	2	2		
CO6	2	2	-	2	1	1	1	-	2	2	2	-	2	2	2		
AVERAGE	2	1.3	-	1.3	1	1	0.7	-	1.3	1.3	1.3	-	1.2	2	2		
CORRELATION LEVELS		1. SLIGHT(LOW)					2. MODERATE(MEDIUM)					3. SUBSTANTIAL(HIGH)					
<b>UNIT I – MARINE RESOURCES</b>																	
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																	
<b>UNIT II – UNDERWATER EXPLORATION</b>																	
Exploration, development, Underwater Sound Channels, Underwater instruments for positioning, signal transfer and mapping, production of hydrocarbons, deep sea mining – national developments																	
<b>UNIT III – SUBSEA PIPELINE AND RISERS</b>																	
Introduction subsea pipeline, Pipeline Elements, Piping material selection, Pipeline survey and mapping, Pipeline route; Pipeline Installation Methods. Riser – different types of risers																	
<b>UNIT IV – INTRODUCTION TO UNDERWATER VEHICLES</b>																	
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																	
<b>UNIT V - UNDERWATER NAVIGATION &amp; SENSING SYSTEMS</b>																	
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, Inclinator, Vehicle lighting.																	
														Total: 45 Hours			
<b>TEXTBOOKS:</b>																	
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 & Mukhopadhyay, Mineral Wealth of the Ocean, Oxford & IBH Pub. Co., 2nd, 1999.

**Designed by**

“ Department of Naval Architecture & Offshore Engineering”

<b>PROGRAM</b>		B.E. Petroleum Engineering														
<b>Course Code</b> UDPEO07		<b>Course Name :</b> Petroleum Hazards & Risk					<b>L</b> 3	<b>T</b> 0	<b>P</b> 0	<b>C</b> 3						
<b>Year and Semester</b>	IV Year ( VII Semester )					<b>Contact hours per week</b> (4Hrs )										
<b>Prerequisite course</b>	NIL															
<b>Course category</b>		Humanities and Social Sciences			Management courses			Professional Core			Professional Elective					
		Basic Science			Engineering Science			Open Elective			Mandatory					
								✓								
<b>Course Objective</b>		<b>To understand the various hazards and environmental issues confronting the petroleum operations and remedial measures to be undertaken.</b>														
<b>Course Outcome</b>		At the end of the course, Students will be able to														
		1 Identify the Environmental impacts by the petroleum industry.														
		2 Analyze the impact of drilling and production operations														
		3 Explain the health effects & corrosion of petroleum hydrocarbons														
		4 Identify the waste treatment and disposal methods for environmental protection														
		5 Identify the waste management plans and also disposal processes for Environmental protection														
		6 Identify the Hazard, Hazard evaluation and safety measures.														
<b>POS/ COS</b>	<b>PO 1</b>	<b>PO2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO1 0</b>	<b>PO1 1</b>	<b>PO1 2</b>	<b>POS 1</b>	<b>POS 2</b>	<b>POS 3</b>	
CO1																
CO2																
CO3																
CO4																
CO5																
CO6																
Average																
<b>Correlation Levels</b>			1.Slight(Low)					2.Moderate(Medium)					3.Substantial(High)			
<b>KL-Knowledge Level:K1-Remember,K2--Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create : PO-Programe Outcome:</b>																
<b>CO-Course Outcome :PSO-Programe Specific Outcome</b>																
<b>UNIT-IIntroduction to environmental control in the petroleum industry (9Hrs)</b>																
Atmospheric Impacts; Aquatic Impacts; Terrestrial Impacts; Ecosystem Impacts; Potential Emergencies- Ozone depletion, GHG emissions, NOx and SOx emissions, SPM emissions etc. Case studies																
<b>UNIT-II The impact of drilling and production operations (9Hrs)</b>																
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.																
<b>UNIT-III Environmental transport of petroleum wastes (9Hrs)</b>																
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:**

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

Designed by

“ Department of Petroleum Engineering”

<b>PROGRAM</b>		BE-Mechanical Engineering			
Course Code: UDMCO07	<b>ALTERNATIVE SOURCES OF ENERGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3
Year and Semester	IV Year (VII Semester)		Contact hours per week ( 3Hrs )		
Prerequisite course					
Course category	Humanities and Social Sciences	Management courses	Professional Core	Professional Elective	
	Basic Science	Engineering Science	Open Elective	Mandatory	
			✓		
Course Objective	<ol style="list-style-type: none"> <li>To learn about commercial energy</li> <li>To learn about solar energy</li> <li>To understand about wind energy</li> <li>To learn about bio-energy</li> <li>To learn about ocean energy sources</li> </ol>				
Course Outcome	<ol style="list-style-type: none"> <li>After completing this course, the students will be able to apply the commercial energy</li> <li>They will be able to know the significance of solar energy</li> <li>The students will be able to analyze the wind energy</li> <li>They will be able to apply the concept of bio-energy</li> <li>They will be able to know the ocean thermal energy sources</li> <li>The students will be able to apply the geo thermal energy concept.</li> </ol>				
<p><b>UNIT I COMMERCIAL ENERGY</b> <span style="float: right;"><b>9 Hours</b></span></p> <p>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.</p> <p><b>UNIT II SOLAR ENERGY</b> <span style="float: right;"><b>9 Hours</b></span></p> <p>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</p> <p><b>UNIT III WIND ENERGY</b> <span style="float: right;"><b>9Hours</b></span></p> <p>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.</p> <p><b>UNIT IV BIO-ENERGY</b> <span style="float: right;"><b>9 Hours</b></span></p> <p>Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion -</p>					

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.

**UNIT V OTHER TYPES OF ENERGY**

**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

<b>PROGRAM</b>	B.E.														
<b>Course Code PDBTO09</b>	<b>Ornamental Fish Culture</b>										<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
											1	1	1	3	
<b>Year and Semester</b>	III year and VII Semester										Contact hours per week (2 Hrs )				
<b>Prerequisite course</b>	Any under graduate degree with Engineering background														
<b>Course category</b>	<b>Humanities and Social Sciences</b>					<b>Management courses</b>					<b>Professional Core</b>			<b>Professional Elective</b>	
	<b>Basic Science</b>					<b>Engineering Science</b>					<b>Open Elective</b>			<b>Mandatory</b>	
											✓				
<b>Course Objective</b>	<ul style="list-style-type: none"> <li>Rearing of both marine and freshwater ornamental fishes is a very simple yet commercially viable business.</li> <li>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.</li> </ul>														
<b>Course Outcome</b>	At the end of the course the student will be able to :														
	1.	Outline the awareness on Ornamental Fish Culture.													
	2.	List out the types and characteristics of ornamental fishes.													
	3.	Compare the setting up of culture facility system.													
	4.	List out the different types of feed and aquarium maintenance.													
	5.	Summarize regarding the compost of solid wastes through microorganisms and earthworms.													
<b>OS/ COS</b>	<b>O1</b>	<b>O</b>	<b>O</b>	<b>O</b>	<b>O5</b>	<b>O</b>	<b>O</b>	<b>O</b>	<b>O</b>	<b>O</b>	<b>SO</b>	<b>SO</b>	<b>SO</b>	<b>SO</b>	
	O1	1	1		2	1						-			
	O2	2										-			
	O3	1										-			
	O4											-			
	O5	1				2						-			
	O6									-		-			
	<b>verage</b>	.0	.0	.2	.4	.8	.5	.5				-			
	<b>CORRELATION LEVELS</b>			1. SLIGHT (LOW)			2. MODERATE (MEDIUM)			3. SUBSTANTIAL (HIGH)					

**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.