AMET

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

Dr.P.SARAVANAN
REGISTRAR

DATE: 27.03.2019

CIRCULAR

This is to inform that, as per choice based credit system, the III year students have to choose an open elective course from other departments for the ensuing odd semester 2019-20 (5th Semester). Every student has to earn 3 credits by choosing one of the Open Elective Courses from the list of courses attached. The students shall consult their class mentors before opting for an open elective course.

The OEC, on offer, will be subjected to the availability of time table slot, faculty member, class rooms and minimum class strength specified from time to time. The list of courses and the syllabus are uploaded in our university website. Therefore the students are informed to choose the open elective course on or before April 5th 2019 from the Google form available in the website

Encl: List of courses and their syllabus 78 Pages (website)

REGISTRAR

To:

All the Heads of the Department

Copy to

1. The Controller of Examinations
2. The Dean Academic
3. The Director – ICT Enabled Education
4. The Secretary to the Vice – Chancellor

Open Elective Courses

Introduction

University Grants Commission has come up with the Choice Based Credit System (CBCS) in which the students have a choice to choose from the prescribed courses, which are referred as core elective, open elective courses and they can learn at their own pace and the entire assessment is graded-based on a credit system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad.

Choice Based Credit System (CBCS) is promoted in such a way that different open elective courses should be offered by every department in engineering 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 a 'cafeteria' approach in which the students can 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.
- The system improves the job opportunities of students.
- The system 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 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

S.No	Department	Semester	Title of the OEC
1	EEE	V	Introduction to Robotics
			Servicing of Electrical Appliances
			Industrial Automation
2	AMET Business School	V	Basics of Entrepreneurship Development
			Containerization and Linear Trade
			Organization Development
			Psychology
3	Food Processing Technology	V	Alcoholic Beverage Technology
			Meat and Poultry processing technology
			Marine Food Product Processing
4	Information Technology	V	Web design fundamentals
			Machine Vision
			SQL Programming
5	Marine Engineering	V	Special duty vessels and types of operation
			Marine Corrosion and Prevention
6	Mining Engineering	V	Methods of Excavation and Transport
			Mineral Resources of India
			Disaster Management
7	Petroleum Engineering	V	Oil and Gas Processing Technology
			Petroleum refining technology
			Petroleum Geoscience
8	Mathematics	V	Advance Numerical Methods
			Numerical solution of partial differential equation

			Number theory and Cryptography
9	Physics	V	Optics and Photonics
			Laser systems and applications
			Space science
10	Mechanical Engineering	V	Fundamentals of Welding
			Engineering Instruments and Measurements
			Pump and Pumping system
11	Marine Bio Technology	V	Biological solution for fouling and corrosion
			Biomaterials for Engineering applications
12	Naval Architecture and Offshore Engineering	V	Introduction to Engineering simulations- A Hands on practice
			Fishing Vessel and Workboat design
			Marine Corrosion and Control
13	Nautical Science	V	Marine and Maritime Employment
			Pump Operation and Maintenance
14	Yoga	V	Yoga for health

Syllabus for the Open Elective Courses

<table>
<tr><td>PROGRAM</td><td colspan="6">B.E- Electrical and Electronics Engineering</td></tr>
<tr><td>Course Code:
UDEE004</td><td colspan="2">Course Name :
Introduction to Robotics</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">III Year / V 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 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></td><td colspan="2">√</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="6">• To understand the basics of robotics
• To learn electrical drives
• To know different types of sensors for robot operations
• To develop robots with links and effectors to achieve challenging tasks
• To explore the broad scope of robotic applications</td></tr>
<tr><td>Course Outcome</td><td colspan="6">After completion of the course, the students will be able to
1. illustrate the fundamentals of Robotics
2. Understand the functions of basic components of a Robot
3. Interpret various types of Sensors
4. Study various types of End Effectors
5. Optimize safety and reliability
6. Infer latest robotic applications</td></tr>
</table>

Unit 1: INTRODUCTION **9 Hrs**

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 Hrs**

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 Hrs**

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 Hrs**

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: APPLICATIONS OF ROBOTS **9 Hrs**

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

Total :45 Hours

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.

<table>
<tr><td>PROGRAM</td><td colspan="6">B.E- Electrical and Electronics Engineering</td></tr>
<tr><td>Course Code
UDEE005</td><td colspan="2">Course Name :
Servicing of Electrical Appliances</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td colspan="2"></td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Year and Semester</td><td colspan="2">III Year / V Semester</td><td colspan="4" 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 learn the servicing of various Electrical appliances.
2. To understand the importance of earthing for safe operation</td></tr>
<tr><td>Course Outcome</td><td colspan="6">At the end of the course the students should be able to:
1. Understand the fundamental concepts of Electrical appliances.
2. Apply the concept to trace and identify the fault in low power appliances.
3. Apply the concept to trace and identify the fault in power appliances
4. Illustrate the concept of protective devices and measuring instruments.
5. Understand the importance of earthing for safe operations
6. Analyze any electrical connection and rectify the fault.</td></tr>
</table>

UNIT-I Introduction: **9 Hrs**

Introduction to electrical appliances-Importance of electrical wiring – Principle of domestic wiring- Wiring system using casing & capping, PVC, and concealed system- wiring connections: tube light wiring, staircase wiring, house wiring.

UNIT-II Testing and Fault Identification of low power appliances: **9 Hrs**

Maintenance and repair of domestic equipments - electric iron box- - ceiling fan - electric kettle, heater/immersion heater-washing machine- grinder-mixer

UNIT-III Servicing of high power Appliances: **9 Hrs**

Testing of different electrical appliances-geyser-hot plates-pumps– induction stove- refrigerator etc.

UNIT-IV Protection Devices and Testing Equipments: 9 Hrs

Study of fuses- Contactors-Circuit Breakers- Relays - Measurement of voltage, current and resistance using multi meter and Clamp meter - Usage of continuity tester- line tester - test lamp.

UNIT-V Practice on Earthing and Electrical safety: 9 Hrs

Basic principles of earthing-different methods of earthing-importance of earthing- fundamental of safe installation of equipments – precautions & prevention of electrical shock- Types of Shocks - first Aid.

TOTAL:45 Hours

TEXT BOOKS:

1. Troubleshooting and Repairing Commercial Electrical Equipment by David Herres, Mc Graw Hill Publications, 2013
2. Elements of Induction Heating design and control application by S. Zinn, S. L. Semiatin, ASM international publications.

REFERENCE BOOKS:

1. Elstan A. Fernandez, Marine Electrical technology.
2. Electrical Safety, Fire Safety Engineering and Safety Management by S. Rao, R.K. Jain, H.L. Saluja.

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E- Electrical and Electronics Engineering</td></tr>
<tr><td rowspan="2">Course Code: UDEE006</td><td rowspan="2">Industrial Automation</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>III Year / V Semester</td><td colspan="4" rowspan="2">Contact hours per week
(3Hrs)</td></tr>
<tr><td>Prerequisite course</td><td>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. To acquire familiarity about various industrial instrumentation types, their parameters and different types of measurement techniques
2. To Learn about industrial PLC, DCS ,SCADA and its applications.
3. To impart fundamental knowledge on Networking Communication and Protocols</td></tr>
<tr><td>Course Outcome</td><td colspan="5">After completion of the course, the students will be able to
1. ability to select sensors and transducers according to the applications
2. learn the various control Elements.
3. Study PLC and DCS for Industrial applications
4. Illustrate the concepts of SCADA for Industrial applications
5. Study about the applications of Marine and Petrochemical indusry
6. Outline the basic needs of an industry requirements</td></tr>
</table>

Unit 1: Introduction to Industrial Automation **9 Hrs**

Measurement of Process Parameters, Pressure, Temperature, flow, level, Displacement and Speed, Virtual Instrumentation and Data Acquisition System

Unit 2: Fundamentals of Automatic process control **9 Hrs**

Need for process control , I/P, P/I converters ,basic Control elements, open loop and closed loop control systems, Set point, Valve positioned and its importance , Pneumatic and electronic control valves,, Solenoid Value, Actuators, Relays and Contactors.

Unit 3: Introduction to PLC and DCS **9 Hrs**

Introduction to Programmable Logic Controllers ,Overview, functions & features ,typical areas of applications, Concept of DCS, advantages and limitations of DCS, Comparison of PLC and DCS

Unit 4: Introduction to SCADA and HMI **9 Hrs**

Introduction to SCADA, Different Systems in SCADA like Field Instrumentation, Remote terminal unit (RTU), Master terminal Unit (MTU), Human machine Interface (HMI), Need, Advantages – HMI real time application for industry process-Evolution.

Unit 5: Industrial Applications : **9 Hrs**

Applications of PLC and SCADA in Marine and petrochemical process industry.

Total :45 Hours

Text Books

1. C.D.Johnson, Process Control Instrumentation, Prentice Hall India Learning Private Limited

2. D. Patranabis, 'Principles of Industrial Instrumentation', Tata McGraw Hill Publishing Company Ltd, 1996.

References

1. Industrial Instrumentation, Control and Automation, S. Mukhopadhyay, S. Sen and A. K. Deb, Jaico Publishing House, 2013

2. Doeblin: Measurement Systems: Application and Design, TMH

3. Industrial Instrumentation, Control and Automation, S. Mukhopadhyay, S. Sen and A. K. Deb, Jaico Publishing House, 2013

<table>
<tr><td>PROGRAM</td><td colspan="6">ABS UG – OPEN ELECTIVE</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name :
Basics of Entrepreneurship Development</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">III (V 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="2">Course category</td><td>General</td><td>Foundation</td><td>Core / Professional</td><td colspan="2">Elective</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">Open</td></tr>
<tr><td>Course Objective</td><td colspan="6">To acquaint the students with knowledge of types of enterprises and entrepreneurial qualities so as to become creative and innovative entrepreneurs</td></tr>
<tr><td>Course Outcome</td><td colspan="6">The Students will be able to
1. To know the basics of entrepreneurship
2. Learn the process of setting up a new business together with problems to be faced
3. Learn about project management
4. Learn about financial analysis and sources of finance
5. Get an idea about marketing channels.</td></tr>
</table>

UNIT 1:ENTREPRENEURSHIP **10 Hours**

Definitions and Structure, The Entrepreneurial Culture, The Concept of Entrepreneurship, classification and Types of Entrepreneurs, Entrepreneurial Traits and Motivation, , Entrepreneur Vs. Salaried people

UNIT 2: SETTING UP A SMALL INDUSTRY& PROBLEMS OF ENTREPRENEURSHIP **10 Hours**

Steps for Starting a Small Industry, Selection of Types of Organization, Incentives and Subsidies, Problems of Entrepreneurship, Sickness in Small-scale Industries - Reasons and Remedies, Importance of SME to our Economy.

UNIT 3: PROJECT MANAGEMENT **9 Hours**

Concept of Projects and Classification, Project Report, Project Appraisal, Factory location and Layout , Institutions in Aid of Entrepreneurs. Development of Women Entrepreneurs

UNIT 4: FINANCIAL ANALYSIS & SOURCES OF FINANCE **9 Hours**

Financial Appraisal, Break-Even Analysis, Profitability Analysis, Sources of Development Finance, Project Financing, Institutional Finance to Entrepreneurs.

UNIT 5: MARKETING CHANNEL **7 Hours**

Methods of Marketing, Marketing Channels, Marketing Institutions and Assistance, Setting Quality Standards.

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

<table>
<tr><td>PROGRAM</td><td colspan="6">ABS UG – OPEN ELECTIVE</td></tr>
<tr><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">Course Name :
Containerization and Liner Trade</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">III (V Semester)</td><td colspan="4" rowspan="2">Contact hours per week
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<tr><td>Prerequisite course</td><td colspan="2">NIL</td></tr>
<tr><td rowspan="2">Course category</td><td>General</td><td>Foundation</td><td colspan="2">Core / Professional</td><td colspan="2">Elective</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td colspan="2">Open</td></tr>
<tr><td>Course Objective</td><td colspan="6">To understand the liner shipping operations and its related documentations</td></tr>
<tr><td>Course Outcome</td><td colspan="6">The Students will be able to
1. Learn the basics of liner trade
2. Get an insight into the principles os stowage of liner cargo
3. Understand the fundamental of international trade
4. Understand the principles of liner service pricing
5. Get to know about liner carriers’ and merchants’ responsibilities and limitations of liability</td></tr>
</table>

UNIT 1 : INTRODUCTION **9 Hours**

Role of shipping in International Trade – a historical perspective, Characteristics of Liner shipping, Liner Service Routes - North-South East-West Trade routes, service options, basic geography, important ports of the world and their location. Type of Liner Trades – Break-bulk, containerized, Ro-Ro, Refrigerated, Cruise etc. Different types of Liner ships and terminology of measurements of tonnage, carrying capacity and dimensions of a ship, types of liner cargo, on-board cargo handling equipment in a general cargo liner ship**.**

UNIT 2 : PRINCIPLES OF STOWAGE OF LINER CARGO **9 Hours**

Concept of unitization of cargo, safety of cargo, Layout of a ship and stowage plan of a general cargo liner ship, salient features of a general cargo port, the layout and handling equipments and the role of a transit shed. The Bill of Lading, its role and function in international trade, anatomy of a general cargo liner bill of lading, Mates’ Receipt, Tally & Survey of cargo, process of reconciliation of Bill of Lading, the concept of “clean and claused” Bill of Lading.

UNIT 3 : INTERNATIONAL TRADE **9 Hours**

Financial aspects of export-import business, Letter of Credits, Uniform Customs & Practices 500 - 600, INCOTERMS 2010. Concept of a liner voyage, operations, service patterns, frequency & calculation of number of ships required to operate a service. Roles of commercial and technical departments in a general cargo liner company.

UNIT 4 : PRINCIPLES OF LINER SERVICE PRICING **9 Hours**

Structure of general cargo liner tariff, Concept of liner conference and its role in pricing, consortium/alliance, liner agency system - the role of a general cargo liner agent - organization structure and the responsibilities of an agent.

UNIT 5 : LINER CARRIERS' AND MERCHANTS' RESPONSIBILITIES AND LIMITATIONS OF LIABILITY **9 Hours**

Legal aspects of shipping, procedure for cargo claims and the role and responsibilities of various parties.Liner's insurance arrangements including hull and machinery insurance, P & I Associations.

Total 45 hours

TEXT BOOK :

Elements of Shipping, 8th Edition by Alan E. Branch.

<table>
<tr><td>PROGRAM</td><td colspan="6">ABS UG – OPEN ELECTIVE</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name :
Organizational Development</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">III (V 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="2">Course category</td><td>General</td><td>Foundation</td><td colspan="2">Core / Professional</td><td colspan="2">Elective</td></tr>
<tr><td></td><td></td><td colspan="2">PC</td><td colspan="2">Open</td></tr>
<tr><td>Course Objective</td><td colspan="6">To understand the liner shipping operations and its related documentations</td></tr>
<tr><td>Course Outcome</td><td colspan="6">The Students will be able to
1. To increase the level of inter-personal trust among employees.
2. To increase employees' level of satisfaction and commitment.
3. To confront problems instead of neglecting them.
4. Organizational objectives are short-term and medium-term goals that an organization seeks to accomplish.
5. Objectives will play a large part in developing organizational policies and determining the allocation of organizational resources</td></tr>
</table>

Unit 1:Organisational development **9 hours**

An introduction: Organisational Development – Meaning and Definition, History of OD, Relevance of Organisational Development for Managers, Characteristics of OD, Assumptions of OD

Unit 2:Change Process and Models **9 hours**

Organisational Change, Strategies for Change, Theories of Planned Change (Lewin's change model, Action research model, the positive model), Action Research as a Process, Resistance to Change

Unit 3 : Values and Ethics in OD **9 hours**

Professional Values, Value Conflict and Dilemma, OD Values and Changing Themes over Time, Ethics in OD, Ethical Dilemmas in Practicing OD, Factors that Influence Ethical Judgment

Unit 4 : Human Resource Interventions **9 hours**

HRM Interventions, Goal Setting, Performance Appraisal, Reward Systems, Career Planning and Development, Managing Workforce Diversity, Employee Wellness

Unit 5 : Future of OD **9 hours**

Organisational Development and Globalization, Emerging Trends in OD - Expanding the use of OD, Combining traditional "hard" business competencies and OD, Creating whole system change, Using OD to facilitate partnerships and alliances, Enhancing constant learning, Trends within the Organisation

Total 45 hours

TEXT BOOK

Organisational development and change, 10th edition, by Thomas G. Cummings (Author), Christopher G. Worley (Author)

PROGRAM B.Tech	Food Processing Technology				
Course Code: UDFPO04	**Alcoholic Beverage Technology**	**L**	**T**	**P**	**C**
		3	0	0	3

Year and Semester	III Year (5th 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	1. To recognize the scope of alcoholic beverages and its scope in market 2. To list the types of beverages and kinds of production 3. To identify the scope of beverages and its marketing with variations 4. To interpret the existing types of beverage with traditional kinds
Course Outcome	After completion of the course, the students will be able to 1. Know about alcoholic beverages and its kinds 2. The level of alcoholic beverage production and the types of alcoholic beverages 3. The use of manufacturing process of various kinds of beer 4. Brewing principle and fermentation process time and maintenance. 5. The distillation and the equipment setup for distillation 6. The various kinds of distillation and the products like spirits and its production

Unit 1:Introduction **9 hours**

Introduction, Beverages, Types of Beverages, Scope of beverage and beverage processing industries, Ancient and Modern methods of beverage processing.

Unit 2:Yeast **9 hours**

Yeast, Introduction, morphological features, the role of yeast in beer and other alcoholic beverages,

Unit 3: Beer and types **9 hours**

Beer, Types of Beer, ale type beer, lager type beer – Introduction, Processing Techniques, Storage and

Packaging.

Unit 4: Brewing **9 hours**

Brewing, Principle of Brewing, Technology of brewing process, equipments used for brewing.

Unit 5: Distillation **9 hours**

Distillation, Principle, Types of distillation, distillation of alcoholic beverages, wine and related beverages, distilled spirits.

Text Book

1. Varnam AH & Sutherland JP. 1994. *Beverages: Technology, Chemistry and Microbiology*. Chapman & Hall.Potter NN.CerealTechnology , AVI Publication, Edition II.

References

1. Hardwick WA. 1995. *Handbook of Brewing*. Marcel Dekker.
2. Hui YH et al 2004. *Handbook of Food and Beverage Fermentation Technology*. Marcel Dekker.
3. Priest FG & Stewart GG. 2006. *Handbook of Brewing*. 2nd Ed. CRC.
4. Introduction- Beverages -Types of beverages and their importance; status of beverage industry in India;

PROGRAM B.Tech	Food Processing Technology				
Course Code: **UDFPO05**	**Meat and Poultry processing Technology**	**L**	**T**	**P**	**C**
		3	0	0	3

Year and Semester	III Year (5th 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	1. To identify the recent trends of meat processing with traditional methods 2. To summarize the methods of meat processing 3. To classify meat and its sources with nutrition aspects 4. To make use of types of meat and processing
Course Outcome	After completion of the course, the students will be able to 1. Describe meat and meat processing 2. Locate the types of meat processing 3. Compare the kinds of meat available for consumption with Poultry 4. Carryout the studies of fish and fish products 5. Use of knowledge to overlap with egg processing 6. Retrieve the complete meat processing of various animals

Unit 1: Introduction **9 hours**

Recent trends in meat processing. Types of Meat and its sources, composition, structure, of meat and meat products. Ante mortem handling, slaughtering of animals, Mechanical deboning, inspection and grading of meat. Post-mortem changes of meat. Color, flavors, microbiology and spoilage factors of meat and meat products.

Unit 2: Meat Processing **9 hours**

Factors affecting post-mortem changes, properties and shelf-life of meat. Meat tenderization and Meat quality evaluation. Modern abattoirs, slaughter house and its features. Preservation of meat- aging, pickling,

smoking.Dried and Cured meat. Canned meat, Frozen meat, Cooked and Refrigerated meat, Sausages.

Unit 3: Fish Processing **9 hours**

Types of fish, composition, structure, and spoilage factors of fish. Post-mortem changes in fish. Handling and transportation of fish. Bacteriology of fish, Chilling of fish, Freezing and Individual quick freezing. Canning and smoking operations, Salting and drying of fish, pickling. Radiation processing of fish and fish products. Seafood quality Assurance, Advances in fishery by products Technology.

Unit 4: Poultry **9 hours**

Introduction, Types and characteristics of poultry products, composition, nutritive value, calculation of nutritive value of poultry products. Unit operation involved in poultry processing.

Unit 5: Egg Processing **9 hours**

Introduction, Types and characteristics of poultry products, composition, nutritive value, calculation of nutritive value of poultry products. Unit operation involved in poultry processing.

Text Book

1. Govindan. T.K, ―Fish Processing Technology , Oxford and IBH Publishers, New Delhi, 1985.
2. Lawrie, R.A. ―Meat Science , Second Edition. Pergamon Press, Oxford, UK. 1975

References

1. Joseph Kerry, John Kerry and David Ledwood. ―Meat Processing , Woodhead Publishing Limited, England (CRC Press), 2002.
2. Mead, G. ―Poultry Meat Processing and Quality , Woodhead Publishing, England, 2004.
3. Stadelmen, W.J. and Cotterill, O.J., ―Egg Science and Technology , Second Edition, AVI, Westport, 1977.

<table>
<tr><td>PROGRAM
B.Tech</td><td colspan="5">Food Processing Technology</td></tr>
<tr><td>Course Code:
UDFPO06</td><td colspan="2">Marine food products processing</td><td>L
3</td><td>T
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0</td><td>C
3</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">III Year (5th Semester)</td><td colspan="4" rowspan="2">Contact hours per week
(3 Hrs)</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 Recognize the adoption of fish processing and its importance
2. To summarize the fish processing and practical utility of fish
3. To use of practical knowledge by gaining theoretical knowledge
4. To classify fish processing with adoptive methods</td></tr>
<tr><td>Course Outcome</td><td colspan="6">After completion of the course, the students will be able to
1. List marine and marine based products
2. Recognize the fish processing and methods
3. Locate the aquaculture and its functions
4. Carryout the fish processing
5. Interpret the fish and its economics
6. Describe fish processing with various adoptive methods</td></tr>
</table>

Unit 1: Introduction **9 hours**

Marine and fresh water fish, shell fish- composition and nutrition commercially important fish and shell fish, names in important Indian languages, important regions, season; spoilage factors,ship board operations, storage and transport.

Unit 2: Aquaculture **9 hours**

Aquaculture:- Soil Chemistry - Hydro Chemistry - Principles Genetics - Hype Physation - Breeding Technique - Developmental Biology - mariculture - Fresh water culture - Management - Advancement in Aquaculture. Feeds - Feeding methods - disease control.

Unit 3: Preservation **9 hours**

Processing and Preservation-chilling, freezing, canning, smoking, curing, salting and drying,

Unit 4: Fish Products **9 hours**

Fish products – Fish balls,fish meal and fish oils; ready-to-eat fish and other sea food products. Byproducts of fish.

Unit 5: Fishery Economics **9 hours**

Introduction of Fishery Economics - Price and Income elasticity - Fishery Industrial Economics - Planning - Co-operatives - Marketing - Export Socio Economic survey - Material management - extension work. safety issues, Indian regulation and quality assurance.

Text Books

1. Hall GM, 1992,Fish Processing Technology, VCH Publishers Inc., NY, 1992
2. Fish as Food; Vol 1 & 2; Bremner HACRC Press. ; 2002,

References

1. Fish as Food, Vol. I-IV; George Borgstrom, Academic Press
2. Fish Processing Technology , Rogestein&Rogestein
3. Fish & Fisheries of India; Jhingram VG; Hindustan Pub Corp, 1983,

UDITO04	WEB DESIGN FUNDAMENTALS	L	T	P	C
		3	0	0	3

PRE-REQUISITE: Basic knowledge of HTML Tags

OBJECTIVES:

The student shall be able to:

- ❖Learn the basics of web concepts and HTML
- ❖Be familiar to use the scripting languages – JavaScript
- ❖Learn to develop XML and DTD documents
- ❖Know the fuzzy control applications
- ❖Learn genetic programming

UNIT I INTRODUCTION TO HTML 9

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) 9

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 9

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

UNIT IV SERVER SIDE PROGRAMMING 9

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

UNIT V INTRODUCTION TO ASP AND JSP **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Apply solutions for static web page problem using HTML
- Design an interactive web page using CSS.
- Design a dynamic web page using Java script
- Implement a service side program in server
- Develop a well formed / valid XML document
- Apply a server side JSP and ASP scripting languages in real world applications

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. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011
2. Jeffrey C Jackson, “Web Technology – A Computer Science perspective”, Pearson Education, 2007

UDITO05	MACHINE VISION	L	T	P	C
		3	0	0	3

PRE-REQUISITE: Basics of Computers

OBJECTIVES:

The students shall be able to:

- Know the basics of machine vision and computer vision
- Study the image acquisition techniques
- Learn the image processing methods
- Understand the methods used for image analysis
- Expose to Image processing Applications

UNIT I INTRODUCTION 8

Human vision – Machine vision and Computer vision – Benefits of machine vision – Blockdiagram and function of machine vision system implementation of industrial machine visionsystem – Physics of Light – Interactions of light – Refraction at a spherical surface

UNIT II IMAGE ACQUISITION 12

Scene constraints – Lighting parameters – Lighting sources, Selection – Lighting Techniques – Types and Selection – Machine Vision Lenses and Optical Filters, Specifications and Selection Imaging Sensors – CCD and CMOS, Specifications – Interface Architectures – Analog andDigital Cameras – Digital Camera Interfaces – Camera Computer Interfaces, Specifications andSelection – Geometrical Image formation models – Camera Calibration

UNIT III IMAGE PROCESSING 10

Machine Vision Software – Fundamentals of Digital Image – Image Acquisition Modes – ImageProcessing in Spatial and Frequency Domain – Point Operation, Thresholding, GrayscaleStretching – Neighborhood Operations, Image Smoothing and Sharpening – Edge Detection –Binary Morphology – Color image processing.

UNIT IV IMAGE ANALYSIS 6

Feature extraction – Region Features, Shape and Size features – Texture Analysis – TemplateMatching and Classification – 3D Machine Vision Techniques – Decision Making.

UNIT V MACHINE VISION APPLICATIONS 9

Machine vision applications in manufacturing, electronics, printing, pharmaceutical, textile,applications in non-visible spectrum, metrology and gauging, OCR and OCV, vision guidedrobotics – Field and Service Applications – Agricultural, and Bio medical field, augmentedreality, surveillance, bio-metrics.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will be able to

- ❖ Apply the vision concepts in various mechatronics applications
- ❖ Analyse the camera interface in analog and digital cameras
- ❖ Recognize the Image acquisition techniques and tools
- ❖ Apply the image processing tools and libraries
- ❖ Analyse the images in the case of Robotic or IoT applications
- ❖ Select the right machine vision system for implementing in industrial applications

TEXT BOOKS:

1. R. Jain, R. Kasturi and B. G. Schunck, “Machine Vision”, McGraw-Hill, 1995.
2. D. A. Forsyth and J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
3. Dana H. Ballard & Christopher M. Brown, “Computer Vision”, Prentice-Hall, 1982.

REFERENCES:

1. Alexander Hornberg, “Handbook of Machine Vision”, First Edition
2. EmanueleTrucco, Alessandro Verri, “Introductory Techniques For 3D Computer Vision”,First Edition
3. Eugene Hecht, A.R. Ganesan “Optics”, Fourth Edition
4. Rafael C.Gonzales, Richard.E.Woods, “Digital Image Processing Publishers”, FourthEdition

UDITO06	SQL PROGRAMMING	L	T	P	C
		3	0	0	3

PREQUISTE: Basic Programming concepts

OBJECTIVES:

The student shall be able to

- Know the importance of query based programming
- Learn the structure and methods used in queries
- Study the data generation, data storage and data manipulation
- Know to apply advanced query patterns
- Learn various Database Technologies

UNIT I INTRODUCTION 9

Database essential –Relational Database fundamentals - Database Management System (DBMS) - History of SQL – uses of SQL- Creating a Database - Data Types -Table Creation - Populating and Modifying Tables -The Bank Schema

UNIT II QUERY MECHANICS 9

Basic Query Structure - Query Clauses – Filtering - Condition Evaluation - Building a Condition - Condition Types - Querying Multiple Tables - Subquery Types – Non-correlated Subqueries - Correlated Subqueries

UNIT III DATA GENERATION, CONVERSION, AND MANIPULATION 9

Working with String Data, Numeric Data, Temporal Data - Conversion Functions - Grouping and Aggregates- Grouping Concepts - Aggregate Functions - Generating Groups - Group Filter Conditions - Conditional Logic - The Case Expression

UNIT IV ADVANCED FEATURES OF SQL 9

Join - Joining Three or More Tables - Self-Joins - Join Conditions Versus Filter Conditions - Working with Sets- Set Operators - Set Operation Rules - Transactions – Transactional Control

statements - Metadata- Data About Data – InformationSchema - Indexes and Constraints – Database Views - Multiuser Databases

UNIT V TRENDS IN DATABASE TECHNOLOGY 9

Overview of Physical storage media - RAID - Data Classification - Spatial and Multimedia databases - Distributed databases - Data Warehousing and Mining – Classification -Association Rules – Clustering - Data Marts.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion, the student shall be able to

- Discuss the importance of query based programming
- Apply various query patterns
- Know to differentiate data generation, data storage and data manipulation mechanisms
- Apply advanced query patterns
- Apply views to break down problem and enhance security
- Observe the current new Database Technologies

TEXT BOOKS

1. Alan Beaulieu, Learning SQL, O'Reilly, 2009

REFERENCE BOOKS

1. Felix Alvaro, SQL: Easy SQL Programming & Database Management For Beginners, Kindle Edition,2016
2. Nathan Clark, SQL: Programming Basics for Absolute Beginners Kindle Edition, 2016

PROGRAM	BE-Marine Engineering				
Course Code UDMEO04	Course Name : Special Duty Vessels and types of Operation	L 3	T 0	P 0	C 3
Year and Semester	IV Year (VII Semester)	Contact hours per week (3 Hrs)			
Prerequisite course	NIL				
Course Objective	1. To summarize different type of special duty vessel. 2. To impart knowledge to the students about special duty ships operation. 3. To precise oil tanker cargo operation.				
Course Outcome	At the completion of the course student will be able to: 1. To classify special duty vessel as per grade. 2. To organize oil tanker cargo operation. 3. To organize route maintenance of oil tanker of oil tanks. 4. To analyze the case operation of LPG & LNG. 5. To approve the various risks of regards and survey towards operation of special duty vessel. 6. To demonstrate safe discharge of variety of oil tanker cargoes				

UNIT I INTRODUCTION

Need for special duty vessels with reference to development of trade and necessities of the trade. Operation of Bulk carriers – Bulk Grain and ore etc., - Banana carriers – Coal Carriers – Forest Products carriers – Timber carriers – Container vessels.

UNIT II OIL TANKER CARGO OPERATIONS

Pipeline systems – Ring main – Direct Line – Combined – Free flow system – Stripping lines. Lining up pipe lines and cargo operations – loading more than one grade – discharging –ballasting – precautions – ship / shore check list safety goods – sources of ignition on – static electricity – precautions to prevent ignition due to static electricity cargo operations when not secured alongside – procedure if oil spill occurs – oil record books.

UNIT III OIL TANKERS ROUTINE OPERATIONS

Inert Gas system – principle – components of system, plant and distribution system – uses of inert gas during tanker operating cycle. Tank washing: Procedure – portable and fixed machines – tank washing

with water –washing atmospheres – crude oil washing (COW) – advantages and disadvantages of COW – operating and safety procedures – gas freeing – pressure vacuum values – "Load on Top" system (LOT) regulations and operation – Segregated Ballast Tanks (SBT).

UNIT IV INTRINSICALLY DANGEROUS CARGOS

Dangerous goods – loaded in bulk – packaging – IMDG code – emergency procedures – „MS & M" notices – general fire precautions, during loading / discharging, - fire fighting and detection system. Liquefied gas cargoes – regulations types of cargo and carriers – LPG and LNG – cargo handling equipments tank monitors and controls – operational procedures loading and discharging of LPG/LNG cargoes – chemical cargoes regulations, operations – bulk chemical carriers – tank material and coatings – tank washing – cargo record book – equipment items precautions to be observed during cargo operations in port – fire protection – personnel protection.

UNIT V RULES AND REGULATIONS

Classification societies for hull, equipment and machineries of Cargo ships and oil tankers – requirements of various types of surveys and certification of Merchant Ships.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Lavery, "Ship board operation", 2nd Edition, Butter Worth- Heinemann, London, 1990.
2. V.K. Bhandarkar, "MS & M Notices to Mariners", 1st Edition, Bhandarkar Publications, Mumbai, 1998.
3. D.J. Eyres, "Ship Construction", 4th Edition, Butter worth – Heinemann, Oxford, 1994.

REFERENCES:

1. Indian Register of Shipping Part1 to Part7, "Rules and Regulations for the construction and classification of steel ships", 1st Edition, Indian Register of Shipping, Mumbai, 1999.
2. International of Maritime Organisation, "SOLAS consolidated Edition 1997", 2nd Edition, Sterling Book House, Mumbai, 1997.

PROGRAM	BE-Marine Engineering				
Course Code UDMEO05	Course Name : Marine Corrosion and Prevention	L 3	T 0	P 0	C 3
Year and Semester	IV Year (VII Semester)	Contact hours per week (3 Hrs)			
Prerequisite course	NIL				
Course Objective	1. To impart knowledge on the Type of corrosion and how this is being controlled in marine environment. 2. To make the students conversant with bimetallic corrosion, metallic corrosion 3. To understand about the conservation of metal in sea water				
Course Outcome	On completion of the course the students are expected to 1. Learn the Causes of corrosion 2. Develop an understanding of basic paint, bitumen chlorinated rubber, phenolic and shipboard preparation for painting 3. Acquire the concepts of atoms, ion, electrochemical and cathodic protection 4. Understand the technique for chemical corrosion and electrochemical corrosion. 5. Analyze corrosion problems related to corrosion and its protection 6. Acquire the knowledge related to paint, anticorrosive paints and corrosion of main engine jacket cooling spaces				

UNIT I INTRODUCTION **9**

Cathodic Protection – Sacrificial anodes protection – Impressed current system protection – Bimetallic corrosion – Design faults causing corrosion – corrosion of metals in sea water, metallic corrosion.

UNIT II HULL PLATE PREPARATION **9**

Plate preparation during building and repair periods -Atmospheric corrosion Mill scale – flame cleaning – Acid Pickling – Blast cleaning – causes of paint failure – shipboard preparations for painting – power wire brushing – power discing – air hammer – high pressure water blasting – sand blasting shot blasting.

UNIT III MODERN PAINT TYPES **9**

Basic composition of paint Albyd – bitumen or pitch – chlorinated rubber – coaltar epoxy – Epoxy – oleoresinous – phenolic – polyurethane – primers – vinyl – self polrshing copolymers – shipboard paint systems – underwater AF paints – boot top anti corrosive paints – super structure paints.

UNIT IV CORROSION IN BOILER **9**

Atoms & Ions, Ph value electrochemical corrosion, Direct chemical attack – Electro chemical attack – reason – remedial measures. Effect of salts & Grease in feed water. Effect of corrosion while boiler not in service – preservation to avoid corrosion. CORROSION IN MARINE DIESEL ENGINES: Corrosive wear of cylinder liners – Reasons and remedies – corrosion of Main Engine Jacket cooling spaces – Reasons and remedies – corrosion in bearings.

UNIT V CORROSION AND ITS PREVENTION

Mechanism of corrosion – Chemical corrosion – Electro chemical corrosion – Anomic & cathodic protection – forms of metallic coatings – anodizing – phosphating.

TOTAL: 45 PERIOD

TEXT BOOKS:

1. Lavery, H.I.,"Shipboard operations" Institute of Marine Engineers Publication
2. Schweitzer, „ Fundamentals of Corrosion",1st Ed. Taylor & Francis, Indian Reprint 20129 (Yesdee Publishing Pvt. Ltd.)
3. M.E.P., "Corrosion For Marine & Offshore Engineers ", Marine Engineering Practice, Vol.02,Part 11, IMarEST, London
4. Francis Laurence LaQue , " Marine corrosion: causes and prevention", 1st Ed., Wiley, 1975
5. Claire Hellio, Diego M. Yebra, Pinturas Hempel S.A., "Advances in Marine Antifouling Coatings and Technologies", Woodhead Publishing, 2009

REFERENCES:

1. Pierre R. Roberge, "Corrosion Engineering Principles and Practice", 1st Ed.,McGraw-Hill, 2008
2. Zaki Ahmad, "Principles of Corrosion Engineering and Corrosion Control",1st Ed. Elsevier Ltd.,2006

<table>
<tr><td>PROGRAM</td><td colspan="5">Common to all Departments</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Course Name:
Methods of Excavation and Transport</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 / Semester</td><td colspan="2">III Year / V 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="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. The objective of this course is to provide students in mining engineering with thenecessary knowledge to design safe, efficient and environmentally responsible surfacemining operations.</td></tr>
<tr><td>Course Outcome</td><td colspan="5">Students will be able to:
• Define the types of transportation of mineral ore
• Describe the batch process of excavation of a rock
• Explain the methods used in channeling of rock
• Discuss the calculation of production by various methods
• Describe the step-wise process in transportation of mineral
• Explain the advantages & disadvantages of various methods of rock excavation & transport</td></tr>
</table>

UNIT I : INTRODUCTION **(10 Hrs.)**

Modes of excavation and transportation – Cyclic – continuous – semi-continuous – Scrapers– dozers – conveyors

UNIT II : CYCLIC METHODS OF EXCAVATION **(10 Hrs.)**

Shovel-dumper operation – Applicability and limitations of electric shovel – hydraulic excavators and dumpers – Cycle time and productivity calculation for shovel and dumper – Estimation for equipment required for a given mine production – Dragline operation - Applicability and limitations– Different

modes of operation – Side cast diagram and calculation of reach – Cycle time and productivity calculation – Calculation of required bucket capacity for a given handling requirement.

UNIT III CYCLIC METHODS OF TRANSPORT (10 Hrs)

Scrapers, Dozers, Front-end-loaders – Applicability and limitations –Types and classification – Method and cycle of operation.

UNIT IV CONTINUOUS METHODS OF EXCAVATION & TRANSPORT (10 Hrs)

Bucket wheel excavators – Applications and limitations – Types and principles of operation – Operational methods – half block method, full block method – Calculation of productivity – Continuous surface miners – Types, Applications and limitations, principles of operation – Operational methods – full bench method, block mining method, stepped cut method, empty travel back method, continuous mining method – Conveyors – Shift able and high angle conveyors – Mode of operation – applicability and limitations – Merits and demerits of conveyor as a system of transportation.

UNIT V SEMI-CONTINUOUS METHODS OF EXCAVATION & TRANSPORT (10 Hrs)

Continuous excavation and partly/fully cyclic transport system – Different methods and Applicability& limitations – Cyclic excavation and partly/fully continuous transport system – different in-pit crushing and conveying and their respective applicability & limitations.

TOTAL :50Hours

TEXT BOOKS:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Hartman H.L., Introductory Mining Engineering, John Wiley and Sons, 2002.

REFERENCES:

1. Hartman, H.L. (Ed.), SME Mining Engg. Handbook Vol. I and II, Society for Mining, Metallurgy, and Exploration, Inc., 3rd edition, 2011.

<table>
<tr><td>PROGRAM</td><td colspan="5">Common to all Departments</td></tr>
<tr><td></td><td colspan="2">Course Name :
MINERAL RESOURCES OF INDIA</td><td>L
3</td><td>T
0</td><td>P
0</td><td>C
3</td></tr>
<tr><td>Year / Semester</td><td colspan="2">III Year / V 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="4">Course category</td><td>Humanities and Social Sciences</td><td>Management courses</td><td colspan="2">Professional Core</td><td>Professional Elective</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td></td></tr>
<tr><td>Basic Science</td><td>Engineering Science</td><td colspan="2">Open Elective</td><td>Mandatory</td></tr>
<tr><td></td><td></td><td colspan="2">√</td><td></td></tr>
<tr><td>Course Objective</td><td colspan="5">To impart detailed knowledge about the mineral resources of India</td></tr>
<tr><td>Course Outcome</td><td colspan="5">The Students will be able to
Define the properties of metallic and non-metallic minerals
Describe the regulatory frame of mineral authority in India
Discuss the PSU and its role in mining
Explain the distribution of mineral resources in India
Describe the importance of metal minerals
Deliver the outline of mineral and its regulating authority</td></tr>
</table>

UNIT I INTRODUCTION **(10 Hrs)**

Minerals – Physical properties of minerals – Metallic and Non-metallic minerals – Distribution of minerals.

UNIT II GOVERNING BODY OF MINERALS IN INDIA **(10 Hrs)**

Ministry of Mines -Organisational structure – Cabinet minister – Minister of state – Secretary – Financial advisor – Director - Geological Survey of India - Indian Bureau of Mines.

UNIT III PUBLIC SECTOR COMPANIES & INSTITUTIONS **(10 Hrs)**

National Aluminium Company Limited (NALCO), Bhubaneswar - Hindustan Copper Limited (HCL), Kolkata - Mineral Exploration Corporation Limited (MECL), Nagpur - Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur - National Institute of Rock Mechanics (NIRM), Kolar Gold Fields, Karnataka - National Institute of Miners' Health (NIMH), Nagpur.

UNIT IV MINERAL RESOURCES **(10 Hrs)**

Occurrence - Mineral fuels - Coal & lignite – Petroleum - Metallic Minerals – Bauxite –Chromite - Iron ore - Manganese ore - Industrial Minerals – Barytes - Kyanite, andalusite&sillimanite – Magnesite - Apatite & rock phosphate - Talc/steatite/ pyrophyllite – Mica.

TOTAL :45 Hours

TEXT BOOKS:

1. NCERT E books on mining.
2. S.Krishnaswamy Indian mineral resources

REFERENCES:

1. Geological Survey of India
2. United States Geological Survey

PROGRAM	Common to all Departments

UBMN404	Course Name :**DISASTER MANAGEMENT**		**L**	**T**	**P**	**C**
			3	0	0	3
Year / Semester	III Year / V 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	To provide students an exposure terminus, their significance and types. To ensure that students begin to understand the relationship between vulnerability ,disaster ,disaster prevention and risk reduction					
Course Outcome	The Students will be able to • Understand the type of hazards • Discuss the methods to prevent risk • Describe the impact of disaster on development • Explain the contingency plan of disaster management • Discuss the lessons leant from the various disasters • Describe the type of risk and mitigation.					

UNIT I INTRODUCTION **(10 Hrs)**

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

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) **(10 Hrs)**

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), States, Centre and other stake-holders – Institutional Processes and Framework at State and Central level – State Disaster Management Authority (SDMA).

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT (10 Hrs)

Factors affecting Vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in Land-use – Climate change adaptation – IPCC scenario and Scenarios in the context of India.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA (10 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 (10 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 – Forest Fire - 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.

Reference Books:

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

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E. Petroleum Engineering</td></tr>
<tr><td rowspan="2">Course Code
UDPEO03</td><td rowspan="2">Course Name :
Oil & Gas Processing 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>Year and Semester</td><td>III Year (V Semester)</td><td colspan="4" rowspan="2">Contact hours per week
(3 Hrs)</td></tr>
<tr><td>Prerequisite course</td><td>NIL</td></tr>
<tr><td>Course Objective</td><td colspan="5">To understand the basic concept of gas processing and design techniques in various units of oil and gas industry</td></tr>
<tr><td rowspan="7">Course Outcome</td><td colspan="5">At the end of the course, the Students will be able to</td></tr>
<tr><td>1</td><td colspan="4">Define the Concepts Of Natural Gas Processing &Phase Separation techniques involved in gas processing. Also to estimate the flash calculations for vapor and liquid</td></tr>
<tr><td>2</td><td colspan="4">Describe about the Acid Gas Removal process and its design principle for removal of impurities by knowing the basic parameters like diameter, height etc</td></tr>
<tr><td>3</td><td colspan="4">Explain about the Dehydration process of natural gas and to know the design of dehydrator by evaluating the parameters involved in it</td></tr>
<tr><td>4</td><td colspan="4">Explain about the Compressor design and the types of compressors used in Oil and gas industry with its practical applications</td></tr>
<tr><td>5</td><td colspan="4">Classify the NGL’s process and separation of liquid and gas as LPG and its commercial applications</td></tr>
<tr><td>6</td><td colspan="4">Explain the design and operation of various gas processing Equipments</td></tr>
</table>

Unit-I PHASE SEPARATION AND STABILIZATION (9 Hrs)

Introduction – process modules – scope of natural gas processing – phase separation – Separators –Three phase- Principles, Types and its Design Procedures, Condensate Stabilization: Types and its Design Procedure, Condensate stabilization- LTX Stabilization and flash calculations.

Unit- II NATURAL GAS SWEETENING (9 Hrs)

Introduction to Acid gas Treating, Design Considerations, Toxicity, Operation and effect of variables, Absorbent selection, Amine and other absorptive process details- Iron sponge design- Numerical calculations and its Applications.

Unit-III NATURAL GAS DEHYDRATION (9 Hrs)

Glycol process: Operation, Effect of variables, dew point depression, Water content, Calculations- Glycol dehydrator design- Solid bed process; solid desiccant - Design and operation, Effect of process variables, Regeneration and Cooling calculations and hydrocarbon recovery

Unit –IV GAS COMPRESSION (9 Hrs)

Compressor principles and its types, , Reciprocating compressor , Thermodynamics of Compressors, Design and applications of Compressors in Oil and gas industry, Hydrate formation and Inhibition, Pressure Relief Valves, design Procedure

Unit – V NGL RECOVERY AND PIPE DESIGN (9 Hrs)

Objectives of NGL Recovery, Types and method of fractionation, Absorber Sizing, Lean Oil Absorption Design and calculation details of Fractionators, Piping Sizing and Considerations- Numerical problems.

(Total 45 Hrs).

Text Books:

1. Stewart (vol. 1& 2), Surface production & operation – Second edition, Gulf Publishing Con Houston,1999
2. H.Dale Beggs ,Gas Production Operations, OGCC Publications, 1984.

Reference books:

1. D.L.Katz ,Handbook of Natural Gas Engineering, , McGraw-Hill, 1959.
2. Chi U. Ikoku ,Natural Gas Production Engineering, , Krieger Publishing Company, 1992.
3. Norman P. Lieberman ,Troubleshooting Natural Gas Processing: Well head to Transmission, Pennwell Publishing Company, 1997.
4. R.V.Smith, Practical Natural Gas Engineering, , 2nd Edition, Pennwell Publishing Company , 1990.

Designed by	" Department of Petroleum Engineering"

PROGRAM	B.E. Petroleum Engineering				
Course Code UDPEO04	Course Name : Petroleum Refining Technolgy	**L**	**T**	**P**	**C**
		3	0	0	3
Year and Semester	III Year (V Semester)	Contact hours per week (3Hrs)			
Prerequisite course	NIL				
Course Objective	To gain comprehensive knowledge on oil refining and associated downstream processing activities and modern technologies involved in it.				
Course Outcome	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			

UNIT I – INTRODUCTION **(9Hrs)**

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.

UNIT II- SECONDARY PROCESSING **(9 Hrs)**

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"

PROGRAM	DiplomaPetroleum Engineering				
Course Code UDPEO10	Course Name : Petroleum Geoscience	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 Objective	To impart knowledge on the concepts of geology,geophysics and geochemistry for petroleum exploration. Geology -Geomorphic agents, stratigraphy and structural geology, geophysical methods – gravity, magnetic, seismic, data acquisition, processing and interpretation and geochemical evaluation methods.				
Course Outcome	Students will be able to				
	1	Describe about Exploration geophysics			
	2	Discuss about Gravity & magnetic methods			
	3	Interpret Seismic methods			
	4	Analyze Geochemistry			
	5	Explain about Geochemical studies			
	6	Explain about hydrocarbon impurities			

UNIT I:Introduction **9Hrs**

Introduction to geophysics, geophysical methods of exploration, physical properties of rocks-density, susceptability, resistivity, elasticity, factors controlling the properties.

UNIT II:Gravity and Magnetic methods **9Hrs**

Gravity and Magnetic methods – Gravity method –definition, gravity surveying, measurement methods, anomalies data interpretation. Magentic methods – concepts, survey and measurements, anomalies, interpretation.

UNIT III:Seismic methods **9Hrs**

Seismic methods, fundamentals of elasticity, Bulk Modulus, Poisson's ratio, elastic seismic wave theory, body and surface waves, P&S waves, seismic instruments, seismic channels, application of seismic data, interpretation of data and maps.

UNIT IV:Hydrocarbon impurities **9Hrs**

Composition and characteristics of liquid and gaseous petroleum hydrocarbons-normal, branched and

isoalkanes, aromatics, asphaltenes, resins. Hydrocarbon impurities, oil field waters – definitions and charateristics.

UNIT V:Geochemical surveys **9Hrs**

Surface and subsurface geochemical surveys. Role of geochemistry in petroleum exploration, organic matter and kerogen – characteristics and types. Maturation, measurement of maturity-thermal alteration index, vitrinitereflectances. Rock Eval, Hydrogen index, gas chromatography.

TOTAL: 45 Hrs

Text Books:

1. Geology of Petroleum, Leverson, 2nd Edition 2004
2. Structural Geology , M.P Billigs,3rd Edition 2004
3. Geology of India & Burma, M.S. Krishnan, 6th Edition 2009

Reference Books:

1. Outlines of geophysical prosperiy – MBR Ras (1993)
2. Introduction to geophysical property – Dubai M.B.

Designed by	" Department of Petroleum Engineering"

Course Code	Course Name :	L	T	P	C
UDMTE03	**Elective 1: Advanced Numerical Methods**	3	0	0	3

Year and Semester	III[rd] year & V[th]semester	Contact hours per week (4Hrs)
Prerequisite course	Nil	

Course Objectives	1. To solve algebraic, transcendental equations and system of linear equation by various methods and find Eigen value by iteration method. 2. To Interpolate and approximate equal and unequal intervals by various formulae. 3. To discuss approximation of numerical differentiation and integration (single & double). 4. To solve Ordinary Differential Equations (ODEs) in Initial value Problems (IVPs) by various methods. 5. To solving ODEs & Partial Differential Equations (PDEs) in boundary value Problems(IVPs) by various methods
Course Outcomes	On completion of the course, Learners will be able to 1. understand the basic knowledge on solution of eigen values 2. useinterpolation and approximation to solve engineering problems. 3. discuss the numerical differentiation and integration. 4. apply initial value problems for solving first order differential equation. 5. applythe boundary value problems in ordinary and partial differential equations.

Module 1: Solution of Equations And Eigenvalue Problems **9 hours**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

Module 2: Interpolation and Approximation **9 hours**

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference

interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.

Module 3: Numerical Differentiation and Integration 9 hours

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Module 4: Initial Value Problems for Ordinary Differential Equations 9 hours

Single Step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne's and AdamsBash forth predictor corrector methods for solving first order equations**.**

Module 5: Boundary Value Problems in Ordinary and Partial Differential Equations 9 hours

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method**.**

TOTAL: 45hours

TEXT BOOKS:

1. Grewal. B.S., and Grewal. J.S.,"Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2007.
2. Kandasamy,P; Thilagavathy, K; Gunavathi, K, Numerical Methods, S.Chand And Company Ltd, 2007.

REFERENCES:

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5 th Edition, New Delhi, 2007.
2. BrianBradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.
3. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007

Course Code	Course Name :**Elective 2: Numerical solution of partial differential equations**	**L**	**T**	**P**	**C**
		3	0	0	3

Year and Semester	IIIrd year & Vthsemester	Contact hours per week (4Hrs)
Prerequisite course	Nil	
Course Objectives	1. To solvelarge number of algebric linear equation by various methods 2. To solve oneDimensional Parabolic Equations by numerical methods. 3. To solve two Dimensional Parabolic Equations by numerical methods. 4. To solvehyperbolic equationsby numerical methodsby usingvarious methods. 5. To solve elliptic equationsby numerical methodsby various methods	
Course Outcomes	On completion of the course, learners will be able to 1. know the knowledge of solvinglarge number of algebric linear equation. 2. understand the knowledge of solvingone dimensional parabolic equations by numerical methods 3.recognize the knowledge of solvingtwodimensional parabolic equations by numerical methods. 4. apply and understand the knowledge of solvinghyperbolic equationby numerical methods. 5. know the knowledge of solvingelliptic equationsbynumerical methods.	

UNIT I LINEAR SYSTEMS OF EQUATIONS 9 hours

Iterative methods for solving large linear systems of algebraic equations: Jacobi, Gauss-seidel and S.O.R methods - Conditions for convergence of them - Methods for accelerating convergence: Lyusternite's & Aitken's methods - Optimum acceleration parameter for S.O.R method.

UNIT II ONE DIMENSIONAL PARABOLIC EQUATIONS 9 hours

Explicit and Crank-Nicolson Schemes for - Weighted average approximation - Derivative boundary conditions - Truncation errors - Consistency, Stability and convergence - Lax Equivalence theorem.

UNIT III MATRIX NORMS & TWO DIMENSIONAL PARABOLIC EQUATION 9 hours

Vector and matrix norms - Eigenvalues of a common tridiagonal matrix - Gerischgorin's theorems -

Stability by matrix and Fourier-series methods - A.D.I. methods.

UNIT IV HYPERBOLIC EQUATIONS **9 hours**

First order quasi-linear equations and characteristics - Numerical integration along a characteristic - Lax-Wendroff explicit method - Second order quasi-linear hyperbolic equation - Characteristics - Solution by the method of characteristics.

UNIT V ELLIPTIC EQUATIONS **9 hours**

Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using a square mesh - Discretisation error - Mixed Boundary value problems.

L: 45 PERIODS

TEXT BOOKS:

1. Smith G.D., "Numerical Solution of P.D.E.", Oxford University Press, New
2. York, 1995.

REFERENCES:

1. Mitchel A.R. and Griffiths S.D.F., "The Finite Difference Methods in Partial Differential Equations", John Wiley and sons, New York, 1980.
2. Morton K.W., Mayers, D.F., "Numerical Solutions of Partial Differential Equations", Cambridge University Press, Cambridge, 2002.
3. Iserles A., "A first course in the Numerical Analysis of Differential Equations", Cambridge University press, New Delhi, 2010. xx t u u □

PROGRAM	Common to all the BE Programmes offered in AMET (ME, Mech, EEEM, PE, NA &OE, Mining) and B.Tech FPT				
Course Code:	**OPEN ELECTIVE: Number Theory & Cryptography**	**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	1. Knowledge of the basic definitions and theorems in number theory 2. The ability to apply number theory algorithms and procedures to basic problems. 3. To understand the fundamentals of Cryptography				
Course Outcome	At the end of the course, students would: 1. ability to think and reason about abstract mathematics 2. Analyze the vulnerabilities in any computing system and hence be able to design a security solutions 3. Evaluate security mechanisms using rigorous approaches, including theoretical				

Unit - I DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS

Division algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

Unit – II DIOPHANTINE EQUATIONS AND CONGRUENCES

Linear Diophantine equations – Congruence‘s – Linear Congruence‘s – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

Unit - III CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS

Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions

Unit – IV CLASSICAL ENCRYPTION TECHNIQUES

Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

Unit – V BLOCK CHIPERS AND PUBLIC KEY ENCRYPTION

Block chipper principles – block chipper modes and operations – advanced encryption standards (AES) – Public key cryptography – Principles of public key cryptosystem – The RSA algorithm – Elliptic curve arithmetic – Elliptic curve cryptosystem

TOTAL: 45hours

TEXT BOOK:

1. Koblitz, N. "Course on Number Theory and Cryptography", Springer Verlag, 1986

REFERENCES:

1. Menezes, A, et.al. "Handbook of Applied Cryptography", CRC Press, 1996
2. Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery, "An Introduction to the Theory of Numbers".

PROGRAM	B.E, B.TECH					
Course Code:	OPTICS AND PHOTONICS		L	T	P	C
Year and Semester	3, V		2			
Prerequisite course	Fundamentals of Physics					
Course category	Humanities and Social Sciences	Management courses	Professional Core	Professional Elective		
	Basic Science	Engineering Science	Open Elective	Mandatory		
		✓	✓			

Course Objective	1. To Introduce Fourier optics 2. To explain the optics of periodic media 3. To demonstrate working of lasers 4. To describe Fibre optics 5. To apprise the photonic devices
Course Outcome	After completion of the course, the students will be able to 1. To understand the basic concepts to Fourier optics 2. To discuss periodic media and coatings. 3. To demonstrate working of laser beams 4. To analyze Fibre and Integrated optics. 5. To demonstrate the concepts photonic device 6.To summarize the basic understanding of fourier optics and functioning of devices

UNIT 1

Fourier Optics: Diffraction integral; Fourier transformation in beam propagation- Fresnel and Fraunhoffer approximations; Fourier filtering, Image processing; Abbe principle of image formation; principle of phase contrast microscope; Holography- principles of recording and reconstruction.

UNIT 2

Optics of periodic media: multilayer dielectric interference coatings and their applications; photonic crystals; Bragg reflectors.

UNIT 3

Lasers: optical amplification and lasers; characteristics of laser radiation; optics of Gaussian beams.

UNIT 4

Fibre and Integrated Optics: Guided modes; attenuation and dispersion in optical fibres; application in sensors and communication.

UNIT 5

Photonic devices based on acousto- optics, electro-optics and magneto-optics: Intensity, phase and frequency modulation; frequency shifters; optical diode and isolator; directional coupler; spatial light modulator**.**

Total : 45 Hours

Text Books

1. A Text Book of Optics, Subrahmaniyam N. & et Al.

References

1. Optics, 2008, by Ajoy Ghatak

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E, B.TECH</td></tr>
<tr><td rowspan="2">Course Code:</td><td rowspan="2">Laser Systems and Applications</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">3, V</td><td colspan="3" rowspan="2">2</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">Fundamentals of Physics</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. To Introduce concepts of lasers
2. To explain the laser action
3. To demonstrate working of lasers and laser systems
4. To describe different types of Lasers
5. To apprise the applications of Lasers</td></tr>
<tr><td>Course Outcome</td><td colspan="5">After completion of the course, the students will be able to
1. To understand the basic concepts to Laser
2. To discuss lasing action.
3. To demonstrate working of lasers and laser systems
4. To analyze different types of lasers.
5. To demonstrate the applications of lasers
6. To summarize the basic understanding Laser system and their applications</td></tr>
</table>

UNIT-I Introduction:

Review of elementary quantum physics, Schrodinger equation, concept of coherence,

UNIT-II

Absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B

coefficients, population inversion, pumping, gain, optical cavities.

UNIT-III Lasers & Laser Systems:

Main components of Laser, principle of Laser action, introduction to general lasers and their types. Three & four level

UNIT IV

Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.

UNIT -V Applications:

Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography.

Total : 45 Hours

Text Books

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.

References

1. S. A. Ahmad, "Laser concepts and Applications" New Age International.

<table>
<tr><td>PROGRAM</td><td colspan="5">B.E, B.TECH</td></tr>
<tr><td rowspan="2">Course Code:</td><td rowspan="2">Space Science</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">3, V</td><td colspan="3" rowspan="2">2</td></tr>
<tr><td>Prerequisite course</td><td colspan="2">Fundamentals of Physics</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>✓</td><td colspan="2"></td></tr>
<tr><td>Course Objective</td><td colspan="5">1. To Introduce Space science
2. To explain the formation of solar systems
3. To demonstrate formation of stars
4. To describe origin of galaxies
5. To apprise the creation of universe</td></tr>
<tr><td>Course Outcome</td><td colspan="5">After completion of the course, the students will be able to

1. To understand the basic concepts to Space.
2. To discuss the laws of solar system.
3. To demonstrate formation of stellar objects
4. To analyze evolution and origin of galaxies.
5. To demonstrate creation of Universe
6. To summarize the basic laws of space science and formation of universe</td></tr>
<tr><td colspan="6">Unit 1: Introduction

Introduction to space science and applications, historical development

Unit 2: Solar System</td></tr>
</table>

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 3: Stars:

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 4: Galaxies:

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

Unit 5: Creation of Universe:

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 Hours

Text Books

1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International. 2

References

1. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International.

PROGRAM	B.E. Mechanical Engineering				
Course Code	Course Name **FUNDAMENTLS OF WELDING**	L **3**	T **0**	P **0**	C **3**
(Common to All Engineering Courses)					
Year and Sem	**III/V**	Course Type	Open Elective Course		
Prerequisite Course	Engineering Materials / Materials Science	Contact Hours per week	3		
Course Objective	1. To learn about the power sources for welding processes				
	2. To learn about fusion welding processes				
	3. To learn about solid state welding processes				
	4. To understand about special welding processes				
	5. To learn about welding metallurgy.				
Course Outcome	1. After completing this course, the students will be able to understand the power sources in welding				
	2. They will be able to understand the fusion welding processes				
	3. They will be able to understand solid state welding processes				
	4. The students will be able to understand the special welding processes				
	5. They will be able to understand the concept of welding metallurgy				

UNIT I POWER SOURCES **9 Hrs**

Classification of welding processes - heat sources, power sources, arc characteristics, V-I relationship, different types of electrodes, ingredients and function of electrode coverings, types of weld joints.

UNIT II FUSION WELDING PROCESSES **9 Hrs**

Shielded metal arc welding, gas welding, TIG welding, MIG welding, Submerged arc welding processes

UNIT III SOLID STATE WELDING PROCESSES **9 Hrs**

Resistance, friction, friction stir, ultrasonic, induction pressure, diffusion welding processes, explosive welding

UNIT IV SPECIAL WELDING PROCESSES 9 Hrs

Electron beam, laser beam welding, plasma arc processes; advantages, limitations, Introduction to Robotic welding, underwater welding.

UNIT V WELDING METALLURGY 9 Hrs

Weld thermal cycles and their effects, effects of pre and post weld heat treatments, concept of HAZ, concept of weldability and its assessment. Welding of different materials, defects in welds, their causes and remedies.

TEXT BOOKS

1. Cornu. J.,(2004)"Advanced Welding Systems"-Volumes I, II and III, JAICO Publishers.

REFERENCES

1. Lancaster L.F, (1996) 'The Physics of Welding', Pergamon Press.
2. Welding Handbook (Section I) American Welding Society1999
3. Parmer R.S, (2005) "Welding processes", Khanna publishers.
4. Srinivasan N.K, (2004) "Welding Engineering", Khanna publishers.
5. Rao P.N – (1998)"Manufacturing Technology (Foundry, Forming and Welding) II Edition", Tata McGraw Hill Pub. Co. Ltd,. New Delhi.

PROGRAM	B.E. Mechanical Engineering				
Course Code	Course Name **Engineering Instruments and Measurements**	L **3**	T **0**	P **0**	C **3**
(Common to All Engineering Courses)					
Year and Sem	**III/V**	Course Type	Open Elective Course		
Prerequisite Course	Physics	Contact Hours per Week	3		
Course Objective	1. To learn about the measurement systems				
	2. To learn about the parameter measurements				
	3. To understand about linear and angular measurements				
	4. To understand about the metrology of surfaces				
	5. To learn about the advanced metrology				
Course Outcome	After completing this course, the students will be able to understand the general concept of measurement systems				
	1. They will be able to understand the parameter measurements				
	2. They will be able to understand about linear and angular measurements				
	3. The students will be able to understand about the metrology of surfaces				
	4. They will be able to understand about the advanced metrology				

UNIT I : MEASUREMENT SYSTEMS **9 Hrs**

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

UNIT II : PARAMETER MEASUREMENTS **9 Hrs**

Measurement of force, torque, power using mechanical, pneumatic, hydraulic, electrical instruments - flow measurement - rotameter, pitot tube - Temperature measurement - bimetallic strip, thermocouple, electrical resistance thermometer

UNIT III : LINEAR AND ANGULAR MEASUREMENTS **9 Hrs**

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

UNIT IV : METROLOGY OF SURFACES **9 Hrs**

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

Total 45 Hrs

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

PROGRAM	B.E. Mechanical Engineering				
Course Code	Course Name	L	T	P	C
	PUMP AND PUMPING SYSTEM	**3**	**0**	**0**	**3**
(Common to All Engineering Courses)					
Year and Sem	**III/V**	Course Type	Open Elective Course		
Prerequisite Course	Fluid Mechanics	Contact Hours per Week	3		
Course Objective	1. To learn about general principle of pumps, pump characteristics curves, frictional losses in pumping systems, definition of various heads and different types of pumps used on board				
	2. To understand about the construction details of reciprocating, gear, screw and rotary displacement pumps.				
	3. To understand centrifugal pump theory and axial flow pump theory, characteristic curves and construction, operation and maintenance.				
	4. To learn about the construction, working, operation and maintenance of different types of valves used on board ships				
	5. To understand the basis of selection of prime movers cargo pumps, types of pumps used, arrangements for deep well and submergible pumps and stripping arrangements provided.				
Course Outcome	1. After completing this course, the students will be able to understand the working principles of pump				
	2. They will be able to learn about positive displacement pumps				
	3. The students will be able to apply centrifugal pump theory and axial flow pump theory, characteristic curves and construction, operation and maintenance				
	4. They will be able to know the Construction, working, operation and maintenance of different types of valves used on board ships				
	5. They will be able to understand the prime movers cargo pumps, types of pumps used, arrangements for deep well and submergible pumps and stripping arrangements provided				

Unit I Pumps and Application 9 Hrs

Introduction, general principle of pumps, characteristics of suction and discharge conditions, frictional losses, definition of various heads, classification of pumps, types of pumps used on ship, working principle of positive displacement and dynamic pumps

Unit II Positive displacement pumps 9 Hrs

Working sequence of single and double acting reciprocating pumps, construction of reciprocating pumps, valve chest and valves, applications, material used, maintenance, construction and working principle of Gear Pumps, Screw Pumps and Rotary Displacement Pumps, their applications, operation and maintenance

Unit III Dynamic Pumps 9 Hrs

Centrifugal pump theory, characteristic curve, relation between head and throughput, parameters needed for selection of centrifugal pumps for specific duty, construction of centrifugal pumps, different types of centrifugal pumps, impellers and casing, arrangements for balancing, axial flow pump theory, characteristic curve and construction, operation and maintenance,

Unit IV Types of valves 9 Hrs

Construction and working principle of globe valve, gate valve, butterfly valve, reducing valve, relief valve and quick closing valve, inspection and maintenance

Unit V Cargo pumps 9 Hrs

Basis of selection of prime movers for cargo pumps, types of pumps used for cargo operation i.e. centrifugal and screw type, arrangements for deep well pumps and submergible pumps, stripping systems

Total Periods: 45 hours

BOOKS FOR STUDY:

1. Marine Auxiliary Machinery - H.D. Mc. George Butterworth-Heinemann; 7 edition (1998)
2. REED'S MARINE ENGINEERING SERIES VOL 8 – General Engineering Knowledge, Thomas Reed., 5th Edition

BOOKS FOR REFERENCES:

1. The Running & Maintenance of Marine Machinery - J.Cowley, Institute of Marine

Engineers, 1992

BIOLOGICAL SOLUTIONS FOR FOULING AND CORROSION

OBJECTIVES

Fouling and corrosion are the two most important challenges in all the industries including marine. Living organisms have great stake on fouling and corrosion. Besides, biological advancements provide ecofriendly solutions for both fouling and corrosion. This course would provide insights into the role of living organisms in causing and controlling both fouling and corrosion with special reference to marine structures

UNIT - 1 - Implications of fouling and corrosion in engineering structures

Introduction - Definitions of Corrosion - Overall classification of types of corrosion- – Biological aspects of corrosion —– Depolarization theory – Case studies- Biofouling of titanium in sea water -Corrosion of medical implants – Biocorrosion of concrete – Metallurgical factors influencing corrosion – Laboratory experiments in corrosion engineering.

UNIT- 2 -Role of living organisms in causing fouling and corrosion

Microbially influenced corrosion (MIC) – definitions, environments and microbiology. Bacterial transport, attachment and affected materials.

UNIT- 3- Role of living organisms in prevention and control of fouling and corrosion

Role of aerobic and anaerobic microorganisms , Mechanisms and models for SRB corrosion., Biofouling of Titanium – biofilm studies. Biofouling of Titanium- biomineralization and corrosion aspects. Microbially induced concrete corrosion

UNIT- 4- Marine Biofouling

Biofouling; Biofilm formation; Marine fouling and boring organisms - their biology, adaptation; Factors influencing the settlement of macrofoulers; Antifouling and Anti boring treatments;

UNIT- 5- Marine Biocorrosion

Environmental remediation- biocorrosion- Corrosion – introduction, definitions and types - Seaweeds for removal of metal pollutants- Corrosion process and control of marine structures.

Reference

1. Denny A Jones,Principles and Prevention of Corrosion (second edition), Prentice Hall, N. J.(1996).
2. Biotechnology and Biodegradation (1990). Kamely, D. Chakraborty, A. & Omenn, G.S.

BIOMATERIALS FOR ENGINEERING APPLICATIONS

OBJECTIVES

Many of the biologically derived materials such as biosurfactants, biopolymers and biomaterials are widely used in Packaging, Constructions, paints, Oil and gas, agriculture/Forestry/Fishery, Electronics, Medical, Dental, and Pharmaceutical Applications. This course would provide an overview of Modern Biopolymers are used in

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- Bioresorsable 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.

References:

1. Biomaterials Science, An Intoduction 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. 4T.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,
6. 1997 Black, J.; Hastings, G. Handbook of Biomaterials Properties, Chapman/Hall, Londo

<table>
<tr><td>PROGRAMME</td><td colspan="5">BE- Naval Architecture & Offshore Engineering</td></tr>
<tr><td rowspan="2">Course Code
OCE - 3</td><td rowspan="2">Course Name :
Introduction to Engineering Simulations-A Hands on Practice</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>2</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td>Year and Semester</td><td colspan="2">III Year (SEMESTER VI)</td><td colspan="3" rowspan="2">Contact hours per week

(4 Hrs)</td></tr>
<tr><td>Prerequisite course</td><td colspan="2"></td></tr>
<tr><td>Course Objectives</td><td colspan="5"></td></tr>
<tr><td rowspan="7">Course Outcome</td><td colspan="5">At the end of the course the students should be able to</td></tr>
<tr><td>1</td><td colspan="4">To develop and understanding of the basis of finite-element analysis and computational fluid dynamics</td></tr>
<tr><td>2</td><td colspan="4">To analyze a structural analysis problem using simulation software</td></tr>
<tr><td>3</td><td colspan="4">To apply the concept of fluid dynamics in analysis of fluid and structure problem using CFD</td></tr>
<tr><td>4</td><td colspan="4">To solve a mathematical problem underlying simulations in MATLAB and examine the data using graphical visualization</td></tr>
<tr><td>5</td><td colspan="4">To compare an existing problem manually and identify the variation using simulation technique</td></tr>
<tr><td>6</td><td colspan="4">Describe the problems through report writing and developing technical writing skills</td></tr>
</table>

UNIT I – OVERVIEW ON ENGINEERING SIMULATIONS

Basics of fluid and solid mechanics, governing equations in CFD and FEA, applications, process – meshing, numerical formulation, solving and data processing, familiarization with CFD and FEA tools. Developments of CFD and FEA applications in industry

UNIT II – BAR AND TRUSS

Axial deformation of bars, axial spring element, Analysis of trusses-Two dimensional truss element

FEA Practice –Analysis of 2D stress distribution

UNIT III- BEAM ELEMENT

Beam bending-Governing equations for beam bending, two node beam element

FEA Practice – Analysis of uniform beams subjected to distributed and point loads

UNIT IV – STEADY STATE ANALYSIS

Explicit and implicit approach - Finite Volume Method – Some conceptual basics and illustrations of 1-D and 2 – D steady problem

CFD Practice – Steady state problem

UNIT V - UNSTEADY STATE ANALYIS

Multi-Physics flow, Free surface modelling – interface tracking and interface capturing techniques – CFD in marine applications

CFD Practice – Unsteady state problem

TEXT BOOKS

1. **John D. Anderson**, *Computational Fluid Dynamics: The Basics with Applications*,1995.
2. **H. Versteeg and W. Malalasekera,***An Introduction to Computational Fluid Dynamics: The Finite Volume Method*, Printice Hall, Second Edition, 2007
3. **C.A.J. Fletcher,***Computational Techniques for Fluid Dynamics, Vol. 1: Fundamental and General Techniques*, 2nd Edition, Springer, 1988
4. **Bhatti, M.A**., Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations, Wiley, 2005.
5. **Reddy, J. N.,**An Introduction to the Finite Element Method, 3rd Edition, McGraw-Hill Science/Engineering/Math, 2005.
6. **Logan D. L**., A First Course in the Finite Element Method, Thomson- Engineering, 3rd edition, 2001.

REFERENCES

1. **WS Atkins Consultants and Members of the NSC,***Best Practice Guidelines for Marine Applications of Computational Fluid Dynamics*, 2003
2. **Chandrupatla T. R., and Belegundu,** A. D., Introduction to Finite Elements in Engineering, Prentice Hall, 2003
3. CFD Software manuals for marine applications
4. NPTEL Lectures

Designed by	" Department of Naval Architecture & Offshore Engineering"

PROGRAM	BE-Naval Architecture & Offshore Engineering										
Course Code OEC - 6	Course Name : FISHING VESSEL AND WORKBOAT DESIGN				**L** 3	**T** 0	**P** 0	**C** 3			
Year and Semester	III Year (SEMESTER VI)				Contact hours per week (3Hrs)						
Prerequisite course	NIL										
Course category	General		Foundation		Core / Professional		Elective OEC-6				
Learning outcome	a	b	c	d	e	f	g	h	i	j	k
	✓	✓			✓				✓		✓
Mapping of instructional Objectives with learning Outcome											
Aim / Purpose of the course	*To understand design of fishing vessel and work boat*										
Instructional objective of the course	Students will be able to										
	1	Understand the importance of fishing									
	2	Understand the storing and preservation of fish onboard									
	3	Understand basic design of fishing vessel and work boat									
	4	Determination of main particulars									
	5	Design the lines plan and calculation of resistance and propulsion.									

UNIT I - INTRODUCTION

Importance of fishing; Classification of fish for harvesting.

UNIT II - FISHING HOLD

Storing and preservation of fish on board a vessel; Fish hold arrangement, Insulation, icing and freezing; Refrigeration machinery.

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UNIT III - VESSEL DESIGN

Design of Fishing vessels, Design of a work boat. General arrangement, layout and equipment on deck.

UNIT IV - MAIN PARTICULARS

Determination of main particulars; estimation of components weights.

UNIT V - PROPULSION

Generation of ship lines; Resistance & Propulsion calculations. Material for construction.

TEXT BOOKS

1. Design of small fishing vessel, john F. Fyson, Food and agriculture organization of the united nations-1985
2. Fishing boats and their equipment, Dag Pike, 1992.

REFERENCES

1. Fishing boat designs, 3small trawlers, issues 188-191, john f,fyson, Food and agriculture organization of the united nations-1985

Designed by	" Department of Naval Architecture & Offshore Engineering"

PROGRAM	BE - Naval Architecture & Offshore Engineering				
Course Code	Course Name:	L	T	P	C
PEC - 5	Marine Corrosion and Control	3	0	0	3

Year and Semester	IV Year (VII Semester)					Contact hours per week					
Prerequisite course	Electro chemistry					(3 Hrs)					
Course category	General		Foundation			Core / Professional			Elective		
Learning outcome	a	b	c	d	e	f	g	h	i	j	k
Mapping of instructional Objectives with learning Outcome											

Aim / Purpose of the course		
Instructional objectives of the course	Students will be able to	
	1	Explain corrosion mechanism and failure
	2	Explain the corrosion Inspection and maintenance
	3	Explain the corrosion protection by protective coatings
	4	Explain application of corrosion inhibitors
	5	Select cathodic and anodic protection systems
	6	Evaluate corrosion life and select suitable methods of corrosion protection

UNIT I- CORROSION FAILURE

Introduction – Corrosion , types and modes of corrosion failures ,mechanism of corrosion ,factures affecting corrosion , Guidelines for investigating corrosion failures , Prevention of corrosion damage – Methods – Corrosion Testing

UNIT II : CORROSION MAINTENANCE THROUGH INSPECTION AND MONITORING

Material selection -Introduction of properties of materials. Acceleration and managing corrosion damage. Smart sensing of corrosion with fiber optics ,Nondestructive evaluation (NDE)

UNIT III : **PROTECTIVE COATINGS**

Coating and coating process, Supplementary Protection systems. Coating materials and properties –Paint coating, metal coating etc. . Surface preparation, Rules and regulations for application of coating, Coating Surveys.

UNIT IV : CORROSION INHIBITORS :

Classification of inhibitors , Corrosion inhibition mechanism , Selection of an inhibitor system

UNIT V:CATHODIC AND ANODIC PROTECTION

Sacrificial Anode CP systems, Impressed Current Systems, Monitoring and Performance of CP systems for marine structures. Anodic Protection – Equipment required for anodic protection, Design concerns.
Project : Modeling and Life prediction for corroded surfaces

TEXT BOOKS

1. Hand Book of Corrosion Engineering by Pierre R.Roberge McGraw –Hill Publication
2. Hsu, H.T. 1981.Applied Offshore Structural Engineering: Gulf Publishing Co., Houston
3. Corrosion and Protection,Engineering Materials and Processes, ISSN 1619-0181,Springer Science & Business Media, 2004

REFERENCE

1. API-RP2A. 1989. Recommended Practice for Planning, Designing and Constructing, Fixed Offshore Platforms: 18th edn. American Petroleum Institute, Washington, D.C.

Designed by	" Department of Naval Architecture & Offshore Engineering"

PROGRAM	BSc-Nautical Science				
Course Code **UDNS512**	**Course Name : Marine and Maritime Employment**	**L**	**T**	**P**	**C**
		2	0	0	2
Year and Semester	III Year (V Semester)	Contact hours per week (2 Hrs)			
Prerequisite course	NIL				
Course Objective	1) To provide wide knowledge of laws relating to employment 2) To areas of employment connected with the seas including working and living conditions. 3) To requirement for employment at sea.				
Course Outcome	1	Understand Marine Employment Opportunities			
	2	Asses Entry requirements for employment at sea			
	3	Identify the scope for Research opportunities			
	4	Research training requirements			
	5	Compare Advantages and Disadvantages of ship and shore based jobs			
	6	Device a model to soft the impact of supply and demand of maritime human resource.			

Unit 1

Marine employment opportunities , investigate career opportunities in the types of employment, marine and maritime industries

Unit 2

Entry requirements - assess personal characteristics and traits in relation to the requirements of prospective employers

Unit 3

Maritime employment opportunities , research scholarships and trainee ,ships that are available in the marine and maritime fields , education standards required for research

Unit 4

Research training requirements, working conditions, rates of pay, hours of work for sea-going and shore-based positions , post-school training details , recognise the shore-based support positions services provided by freight forwarders chaterers, communicators, technicians, etc

Unit 5

advantages and disadvantages of shore , locate advertisements for sea and shoreand sea-based careers based positions in local and national press , features prospective employers may require in applicants , scholarships and traineeships available in the marine and maritime fields

Reference books
1. International Maritime Labour Law Authors: CarballoPiñeiro, Laura

Designed by	" Department of Nautical Science"

PROGRAM	BSc-Nautical Science				
Course Code **UDME504**	**Course Name : Pump Operation and Maintenance**	**L**	**T**	**P**	**C**
		2	0	0	2
Year and Semester	III Year (V Semester)	Contact hours per week (2 Hrs)			
Prerequisite course	NIL				
Course Objective	1.To study the construction and working principle of different types of pumps installed onboard 2.To learn about construction and working principle of different types of valves such as gate valve, butterfly valve etc. 3. To understand the basics of selection of types of pumps for cargo operations.				
Course Outcome	The student can understand				
	1	Operate and carryout maintenance of different types of pumps onboard the ship.			
	2	Design and choose appropriate valves for different systems onboard the ship.			
	3	Design and choose the correct prime movers for different systems onboard ship.			
	4	Sketch the structural arrangement of various types of pumps			
	5	Compare the advantages and limitations of various types of pumps			
	6	Describe the procedure for efficient use of pumps.			

Unit I: **4Hrs**

Pumps and Application Introduction, general principle of pumps, characteristics of suction and discharge conditions, frictional losses, definition of various heads, classification of pumps, types of pumps used on ship, working principle of positive displacement and dynamic pumps

Unit II: **8Hrs**

Positive displacement pumps - Working sequence of single and double acting reciprocating pumps, construction of reciprocating pumps, valve chest and valves, applications, material used, maintenance,

construction and working principle of Gear Pumps, Screw Pumps and Rotary Displacement Pumps, their applications, operation and maintenance

Unit III Dynamic Pumps **8Hrs**

Centrifugal pump theory, characteristic curve, relation between head and throughput, parameters needed for selection of centrifugal pumps for specific duty, construction of centrifugal pumps, different types of centrifugal pumps, impellers and casing, arrangements for balancing, axial flow pump theory, characteristic curve and construction, operation and maintenance,

Unit IV **8Hrs**

Types of valves Construction and working principle of globe valve, gate valve, butterfly valve, reducing valve, relief valve and quick closing valve, inspection and maintenance

Unit V **8Hrs**

Basis of selection of prime movers for cargo pumps, types of pumps used for cargo operation i.e. centrifugal and screw type, arrangements for deep well pumps and submergible pumps, stripping systems

Text Books:

1. Marine Auxiliary Machinery - H.D. Mc. George
2. REED'S MARINE ENGINEERING SERIES VOL 8 – General Engineering Knowledge

Books for References:

1. The Running & Maintenance of Marine Machinery - J.Cowley

Designed by	" Department of Marine Engineering"

Yoga for Health – Common compulsory Elective Paper

Elective Paper – Duration 50 Hours theory, 40 Hours Practical

Unit 1	i. Origin of Yoga & its brief development. ii. Meaning of Yoga & its importance iii. Aim and Objectives of Yoga iv. Yoga Philosophy v. Scope of Yoga vi. Meaning of meditation and its types and principles. vii. Guiding principles viii. Introduction to Hatha Yoga Texts ix. Yoga Guidelines Practical – **Pawanamukthana Series-1** **Eye Exercises** **Hand Exercises** **Neuro Muscular Exercises**
Unit 2	i. Classification of Yoga/Types of Yoga ii. Introduction to Vedas, Vedangas, and Upanishads iii. Introduction to Yoga in Bhagavad Gita iv. Schools of yoga v. Paths of yoga vi. Hatha Yoga, Raja Yoga, Laya Yoga, Bhakti Yoga, Jnana Yoga, Karma Yoga. vii. Patajnajli yoga sutras and Asthanga Yoga **Pawanamukthana Series – II** **Leg Exercises**
Unit 3	i. Principles of Yogic Practices. Meaning of Asana, its types and principles.

	ii. Meaning of Pranayama, its types and principles. iii. Meaning of Kriya its types and principles. **Neuro Muscular Exercises-2** **Pawanakmukthasana series – 3**
Unit 4	i. Yogic Therapies and Modern concept of Yoga ii. Naturopathy, Hydrotherapy, Electrotherapy, Fasting Therapy, Acupressure, acupuncture. iii. Meaning and importance of Prayer. iv. Psychology of Mantras. v. Different mudras during prayers. vi. What is Suriya Namaskar – When to Perform – Benefits - 12 steps – Suryanamaskar – Pranamasan – Astauttanasan – Padahastasan – Aswachanchalanasan – Dandasan – Seshangasan –Astanga Namaskara – Bhujangasana- Parivatasana- sheshangasana- Aswachanchalanasan- padahastasanan- Astauttanasan – pranamasan – Mantras – Breathing PatternEye Exercises
Unit 5	i. Introduction of human body and its systems. ii. Definition of Anatomy and Physiology and importance in Yogic Practices iii. Respiratory System iv. Digestive System v. Endocrine System Kapalabathi
Unit 6	i. Classification of Asanas and its Mechanism ii. Cultural Asana(standing, sitting, supine, praline position Meditative Asana and Relax Asana, Demonstration of Standing Asanas. iii. Nervous System iv. Circulatory System Makarasan Part 1

Unit 7	i. Introduction of Kriya, Bandha and Mudra. ii. Importance of Kriya and its scientific approach. iii. Importance of BANDHA and its scientific approach. iv. Importance of MUDRA and its scientific approach Yoga for Personality Development Makarasan Part 2		
Unit 8	i. Effect of Asanas on various Systems ii. Difference between Asana and Exercise iii. Difference between Pranayama and deep breathing iv. Yogic Diet. v. Pranayama techniques Basics of yoga therapy, Yoga for constipation, yoga for diabetics, yoga for blood pleasure,		
Unit 9	i. Pancha boothas ii. Panch Kosh Theory. iii. Kundalani. iv. Astama Sidhis Yoga for Stress Management Yoga for Thyroid, Yoga for Nervous weakness, Yoga for kidney stone, Diabetics, Low BP and High BP		
Unit 10	**<u>Standing</u>** Vrisksasana Utkatasana Ardha Katichakrasana Traikonsana Natarajarasana	Parivata janu sirasanana **<u>Supine</u>** Navasana Matsyaasana Halasana Pawanamuthasana	**Pranayama** Anulome-vilome Surya Anulom Chandra Anulom Nadi Sudhi Sitkari

	Ekapadasana **Sitting** Padmasana Vajrasana Ustarasana Pachimottasana Supta Vajrasanaanu	Sarvagasana **Prone** Bhujangasana Shalabasana Dhanurasana Makarasana Kandharasana	Seetkalai Bhasthirka Sureyabedhana Chandrabedhana **Meditation** 1. Vipasana 2. Agna Meditation 3. Rajayoga meditaion etc..

Text book

1. Yoga – A healthy way of living - NCERT Book – Secondary Stage
2. Yoga – A Healthy way of living – NCERT Book – Upper Primary
3. Yoga – Official Guide book – Govt. of India – AYUSH – NEW DELHI

Reference Material

1. Yoga sutras by Vivekananda
2. Aasana pranayanm, mudras and Bandas by Satyananda saraswthi