Annexure- I

(Open Elective Subjects)

For 5th Semester Only

Sl. No.	Subject	Code	Eligible students who can take the subjects
1	Disaster Management	CEOE-508	Other than Civil Engineering Dept.
2	Renewable Energy	EEOE-508	Other than Electrical Engineering Dept.
3	Introduction to Embedded System	ECOE-508	Other than Electronics & Telecommunication Dept.
4	Client-side Scripting Language	CSOE-508	Other than Computer Science & Technology Dept.
5	Multimedia & Animation Techniques	ITOE-508	Information Technology Dept.
6	Robotics	MEOE-508	Other than Mechanical Engineering Dept.
7	Environmental Pollution & Control	AEOE-508	Other than Automobile Engineering Dept.
8	History of Indian Architecture	AROE-508	Other than Architectural Assistantship Dept.
9	Food Laws and Regulations	FPOE-508	Other than Food Processing Technology Dept.
10	Nanotechnology	MLOE-508	Other than Medical Laboratory Technology Dept.
11	Fashion Illustration	FTOE-508	Other than Fashion Technology Dept.
12	Engineering Economics & Accountancy	HSOE- 508/A	All Department
13	History of Science and Engineering	HSOE-508/B	All Department

DISASTER MANAGEMENT

(For all branches except Civil Engineering)

Course Code	:	CEOE 508
Course Title	:	Disaster Management
Number of Credits	:	3 (L:3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	OE

Course outcomes:

After competing this course, student will be able to:

- CO 1. Identify the various types of natural and man-made disasters.(K1)
- CO 2. Predict pre- and post-disaster management for some of the disasters.(K3)
- CO 3. Categorize the various information and organizations in disaster management in India.(K4)
- CO 4. Demonstrate the technological tools and their role in disaster management.(K3)
- C0 5. Discover the various aspects of Science and Technology for Disaster Management. (K3)

Detailed Course Content

Module – I: Understanding Disaster

Number of Class hours: 08

Learning Outcomes:

1. Define the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity(K1)

2. Identifying the Disaster and Development(K1)

3. Describe disaster management.(K1)

Detailed content of the unit:

1.1 the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity
1.2 Identifying the Disaster and Development
1.3 Indicate the disaster management.

Module– II: Types, Trends, Causes, Consequences and Control of Disasters

Number of Class hours: 08

Learning Outcomes:

1. Define the Geological Disasters (earthquakes, landslides, tsunami, mining)(K1)
2. Describe the Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves)(K1)
3. Classify Biological Disasters (epidemics, pest attacks, forest fire);(K2)
4. Identify the Technological & Manmade Disasters(K2)
5. Discover the Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.(K3)

Detailed content of the unit:

2.1 Geological Disasters (earthquakes, landslides, tsunami, mining);

2.2 Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves)

2.3 Biological Disasters (epidemics, pest attacks, forest fire)

2.4 Technological Disasters (chemical, industrial, radiological, nuclear)

2.5 Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemi- cals and biological disasters)

2.6 Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Module- III: Disaster Management Cycle and Framework

Number of Class hours: 08

Learning Outcomes:

1. Analyze the Disaster Management Cycle – Paradigm Shift in Disaster Management.
Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and   Micro zonation(K4)
2. Identify the Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development(K4)
3. Recognize the awareness During Disaster – Evacuation – Disaster Communication –

Search and Rescue – Emergency Operation Centre – Incident Command System(K1)

4. Discover the Relief and Rehabilitation –Post-disaster–
   DamageandNeedsAssessment,RestorationofCriticalInfrastructure–Early
   Recovery – Reconstruction and Redevelopment;(K3)

5. Discuss about IDNDR, Yokohama Strategy, Hyogo Frame- work ofAction(K2)

Detailed content of the unit:

3.1 Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation,

3.2 Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

3.3 During Disaster – Evacuation – Disaster Communication – Search and Rescue

3.4 Emergency Operation Centre – Incident Command System – Relief and Rehabilitation –

3.5 Post-disaster–
   DamageandNeedsAssessment,RestorationofCriticalInfrastructure–Early
   Recovery – Reconstruction and Redevelopment;

3.6 IDNDR, Yokohama Strategy, Hyogo Frame- work ofAction.

Module– IV: Disaster Management in India

Number of Class hours: 08

Learning Outcomes:

1. Describe the Disaster Profile of India – Mega Disasters of India and Lessons Learnt.(K1)

2. Discover the Disaster Management Act 2005 – Institutional and Financial Mechanism(K3)

3. Identify the
   NationalPolicyonDisasterManagement,NationalGuidelinesandPlan
   sonDisasterManagement;RoleofGovernment(local,stateandnationa
   l),Non-GovernmentandInterGovernmentalAgencies.(K2)

Detailed content of the unit:

4.1 Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

4.2 Disaster Management Act 2005 – Institutional and Financial Mechanism,

4.3 NationalPolicyonDisasterManagement,NationalGuidelinesandPlansonDisaster Management;

4.4 RoleofGovernment(local,stateandnational),Non-GovernmentandInterGovernmentalAgencies.

Module– V: Applications of Science and Technology for Disaster Management

Number of Class hours: 08

Learning Outcomes:

1. Define the Geo-informatics in Disaster Management(K1)
2. Identify the Disaster Communication System(K2)
3. Discuss the Land Use Planning and Development Regulations, Disaster Safe(K2) Designs and Constructions, Structural and Non Structural Mitigation of Disasters
4. Discover the S&T Institutions for Disaster Management in India(K3)

Detailed content of the unit:

5.1 Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

5.2 Disaster Communication System (Early Warning and Its Dissemination).

5.3 Land Use Planning and Development Regulations,

5.4 Disaster Safe Designs and Constructions,

5.5 Structural and Non Structural Mitigation of Disasters

5.6 S&T Institutions for Disaster Management in India

References

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani,R.K.,Anoverviewonnatural&man-madedisastersandtheirreduction,CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers,Delhi
4. Alexander, David, Natural Disasters, Kluwer AcademicLondon
5. Ghosh, G. K., Disaster Management, A P H PublishingCorporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt.Ltd.

Renewable Energy System

(For all branches except Electrical Engineering)

Course Code	:	EEOE-508
Course Title	:	Renewable Energy System
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites (Course code)	:	NIL
Course Category	:	OE

Course outcomes:

After completion of this course students will be able to:

a) Maintain the optimised working of solar PV powerplants.(K3)

b) Gain knowledge about working principle of windpower plants..(K1)

c) Maintain the optimised working of mini and micro hydropower plants..(K3)

d) To understand the role of Geo-thermal energy and ocean energy in the Energy Generation (K2)

e) Get the utilization of Biogas plants .(K3)

Course contents:

Module – I: Solar Energy

Number of class hours: 6Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Describe theFundamentals of Solar Photo Voltaic Conversion process.

b) Understand the function of different parts of a solar power plant.

c) Explain the working of Solar PV Power Generation systems.

d) Know the applications of Solar PV.

Detailed content of the unit: -

Solar Map of India: Global solar power radiation, Solar PV

Concentrated Solar Power (CSP) plants, construction and working of: Power Tower,

Parabolic Trough, Parabolic Dish, Fresnel Reflectors.

Solar Photovoltaic (PV) power plant: components layout, construction, working.

Rooftop solar PV power system.

Solar PV Applications.

Module – II: Wind Energy

Number of class hours: 10Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Know the Basic principles of wind energy conversion.
b) Know the application of Wind Energy.
c) Explain the working of different types of small wind turbine.

Detailed content of the unit: -

Scope for Wind energy in India, Basic principles of wind energy conversion
Site selection considerations, Basic components of wind energy conversion system,
Application of Wind Energy, Solar wind hybrid system

Horizontal axis small wind turbine: direct drive type, components and working
Horizontal axis small wind turbine: geared type, components and working
Vertical axis small wind turbine: direct drive and geared, components and working.

Module – III: Large and Micro-Hydro Power Plants

Number of Class hours: 8 hours

Suggestive Learning Outcome:

Students would be able to

1. Know the Energy conversion process of hydro power plant.
2. Know the Safe Practices for hydro power plants
3. Understand different types of turbine used in hydro power plants.

Detailed content of the unit: -

Selection of site for hydroelectric plant.

Classification of hydro power plant: High, medium and low head.

Construction and working different types of hydro power plant:

      a. High head – Peltonturbine

      b. Medium head – Francisturbine

      c. Low head – Kaplanturbine.

Differenttypesofmicro-
hydroturbinesfordifferentheads:Pelton,FrancisandKaplanturbines.

Locations of these different types of large and micro-hydro power plants in Tripura.

Module–IV: Geo-Thermal and Ocean Energy

Number of class hours: 8Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Know the sites of Geothermal Energy in India.
b) Know the Resources of geothermal energy.
c) Understand the Principle of OTEC system.
d) Understand the Principle of Tidal Power.
e) Know the Classification of Tidal Power Plants.
f) Know the Electricity generation from Waves.

Detailed content of the unit: -

Geothermal Energy: Introduction, Geothermal sites in India Capacity and Potential, Resources of geothermal energy.

Ocean Thermal Energy: Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation.

Tidal power plants: Basic Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants.

Electricity generation from Waves.

Module– V: Biomass Energy

Number of class hours: 8Hours

Suggestive Learning Outcomes:

Students will be able to:

a) Describe the properties of fuel used in Biomass-based Power Plants.
b) Know the Bio-mass Conversion Technologies.
c) Know the types of biogas plants.
d) Describe the layout of different types of Biomass-based Power Plants.

Detailed content of the unit: -

Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk,

municipal waste.

Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas.

Layout of a Bio-chemical based (e.g. biogas) power plant:

Layout of a Thermo-chemical based (e.g. Municipal waste) power plant

Layout of a Agro-chemical based (e.g. bio-diesel) power plant

References:

2. Deambi,Suneel:FromSunlighttoElectricity:apracticalhandbookonsolarphotovoltaicapplica- tion; TERI, New DelhiISBN:9788179935736

3. DavidM.Buchla,ThomasE.Kissell,ThomasL.Floyd-RenewableEnergySystems,PearsonEdu- cation New Delhi , ISBN:9789332586826,

4. Rachel, Sthuthi; Earnest, Joshua – Wind Power Technologies, PHI Learning, New Delhi, ISBN: 978-93-88028-49- 3; E-book978-93-88028-50-9

5. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology: Towards Sustainable Development; TERI, New Delhi; ISBN:9788179934043

6. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN:978-1603580304

7. Wizelius, Tore &Earnest, Joshua -PHI Learning, New Delhi, ISBN: 978-8120351660

8. Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN:-978-81-203-4470-9

9. Bhadra,S.N.,Kastha,D.,Banerjee,S,WindElectricalSystemsinstallation;OxfordUniversityPress,
New Delhi, ISBN: 9780195670936.

10. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN:978-9386173-683)

Introduction to Embedded Systems

(For all branches except Electronics and Telecommunication Engineering)

Course Code	ECOE-508
Course Title:	Introduction to Embedded Systems
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	OE

Course Outcome:-

On completion of the syllabus, the Students will be able to:-

C.O.1: Illustrate the concept of Embedded systems and RTOS. (K2)

C.O.2: Demonstrate the internal architecture of 8051 microcontroller (K2)

C.O.3:Develop basic embedded c codes for - Boolean and bitwise operations (K3)

C.O.4: Demonstrate embedded c codes for branching and looping operations (K2)

C.O.5: Summarize the real-life applications of the Arduino communication modules (K2)

Course Content:

Module I- Introduction to Embedded systems

No. of Lectures: 6

Suggested Learning Outcomes:

1. Illustrate the concept of Embedded systems.
2. Classify the types of Embedded System.
3. Outline the characteristics of Embedded system
4. Understand the concept of Real time systems and its types.
5. Compare between RTOS and General purpose OS

Content

Introduction to embedded systems. Features of embedded systems. Characteristics of Embedded Systems. Classification of embedded systems. Examples of embedded systems. Architecture of embedded system.

Real time systems, examples of real time systems. Types of real time systems.

Introduction to RTOS, difference between RTOS and General purpose OS. Need for RTOS in embedded systems. Kernel and its functions.

Module II– Microcontroller fundamentals

No. of lectures:6

Suggested Learning Outcomes: The students on completion of Module II shall be able to:

1. Illustrate the basic block diagram of 8051 microcontroller
2. Explain the registers in 8051 microcontroller
3. Demonstrate memory organization in 8051 microcontroller
4. Illustrate the operation of SFRs and IO ports

Content

Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051.

Module III - Embedded C basics operators for Arduino

No. of lectures:6

Suggested Learning Outcomes: The students on completion of Module II shall be able to:

5. Illustrate the Arduino IDE
6. Explain the serial port communication
7. Develop embedded c codes for Boolean operation
8. Develop embedded c codes for pointer access operation
9. Demonstrate embedded c codes for bitwise operation

Content

Familiarizing with the Arduino IDE. Sketch designing for Arduino. Communication interface using serial port. Basic understanding of the code with boolean operations, pointer access operations, bitwise operations, compounded operations.

Module III - Embedded C control structure blocks

No. of lectures: 6

Suggested Learning Outcomes: The students on completion of Module III shall be able to:

1. Develop codes for loop
2. Experiment with codes for while loop
3. Experiment with codes for do-while loop
4. Develop codes for conditional branching operations

Content

Looping mechanism – for, do and whileloops. The branching operations based on conditions expression

Module V- Communication with Arduino and Applications

No. of lectures: 6

Suggested Learning Outcomes: The students on completion of Module V shall be able to:

1. Classify the different communication modules of Arduino.

2. Summarize the real-life applications of the communication modules of Arduino.

3. Outline the various communication interfaces.

Content

Different communication modules available with their real-life application, Communication interface. Case study.

SUGGESTED LEARNING RESOURCES:

1. Arduino Projects For Dummies (For Dummies Series),KennedyGeorge;Davis Bernard;

PrasannaSRM,Wiley (5 July 2013).ISBN : 978-1118551479

2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

3. Make: Getting Started WithArduino - The Open SourceElectronicsPrototypingPlatform

Massimo Banziand Michael ShilohShroff/Maker Media; Third edition (27December 2014)

ISBN : 978-9351109075

4. Real Time Operating System-Rajib Mall

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. https://www.arduino.cc/reference/en/

2. https://learn.adafruit.com/category/learn-arduino

SCRIPTING LANGUAGE(PYTHON)

(For all branches except Computer Science & Technology)

Course Code	CSOE508
Course Title	Scripting Language (Python)
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Knowledge of Programming
Course Category	Open Elective Course

Course Outcomes: -

After the completion of the course Student will be able to

1) Draw flow charts for solving different problems, develop efficient algorithms for solving a problem. (**K3**)
2) Use the various constructs of Python viz. conditional, iteration(**K1**)
3) Write programs making judicious use of Lists, Strings, Tuples, Dictionaries wherever required(**K3**)
4) Manage data using NumPy (**K3**)
5) Handle files and Modules in Python (**K2**)

Course Content:-

Module- 1: Introduction to Programming, Algorithm and Flowcharts

Number of class hours: 05 Hrs

Suggestive Learning Outcomes:

1) Understand the concept and evolution of Programming. **(K1)**
2) Understand the concepts and purposes of algorithm and flowchart. **(K1)**
3) Use algorithm and flowchart to solve problem independent of language. **(K3)**
4) Gain knowledge of different constructs of algorithm and flowchart. **(K2)**

Detailed content of the unit: - The basic Model of computation, Algorithms, Flowcharts, Programming Languages, Compilation, Testing & debugging and documentation, Flow Chart Symbols, Basic algorithms/flowcharts for sequential processing, Decision based processing and Iterative processing.

Module- 2: Introduction to Python

Number of class hours: 07 Hrs

Suggestive Learning Outcomes:

1) Understand features of Python that make it one the most popular languages in the industry. **(K1)**
2) Understand structure of Python problem. **(K2)**
3) Understand the areas where Python is used. **(K2)**

Detailed content of the unit: - Python Introduction, Technical Strength of Python, Introduction to Python Interpreter and program execution, Using Comments, Literals, Constants, Python's Built-in Data types, Numbers (Integers, Floats, Complex Numbers, Real, Sets), Strings (Slicing, Indexing, Concatenation, other operations on Strings), Accepting input from Console, printing statements, Simple 'Python' programs.

Module- 3: Operators, Expressions and Python Statements, Sequence data types

Number of class hours: 9 Hrs

Suggestive Learning Outcomes:
1) Use the basic operators and expressions available in Python in developing program. **(K3)**
2) Understand and use various Python statements like conditional constructs, looping constructs in writing Python program. **(K3)**
3) Work with various built-in Sequence datatypes and their use. **(K3)**
4) Understand the concept of mutable and immutable objects. **(K2)**

Detailed content of the unit: - Assignment statement, expressions, Arithmetic, Relational, Logical, Bitwise operators and their precedence, Conditional statements: if, if-else, if-elseif-else; simple programs, Notion of iterative computation and control flow –range function, While Statement, For loop, break statement, Continue Statement, Pass statement, else, assert.
Sequence Data Types: Lists, tuples and dictionary, (Slicing, Indexing, Concatenation, other operations on Sequence datatype), concept of mutability, Examples to include finding the maximum, minimum, mean; linear search on list/tuple of numbers, and counting the frequency of elements in a list using a dictionary.

Module- 4: Functions, File Processing, Modules

Number of class hours: 9 Hrs

Suggestive Learning Outcomes:

1) Apply the in-built functions available in Python in solving different problems. **(K3)**
2) Work with modular approach using user defined functions. **(K2)**
3) Work with files and reading /writing onto files. **(K3)**
4) Understand the concept of modules and importing, loading and reloading of modules in programs. **(K1)**

Detailed content of the unit: - Functions Top-down approach of problem solving, Modular programming and functions, Function parameters, Local variables, the Return statement, Doc Strings, Global statement, Default argument values, Keyword arguments, VarArgs parameters. Library functions, Time functions, Recursion, Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file, File functions, Command Line arguments, Scope of objects and Names, LEGB Rule, Module Basics, Module Files as Namespaces, Import Model, Reloading Modules.

Module- 5: NumPy Basics

Number of class hours: 07 Hrs

Suggestive Learning Outcomes:
1) Work on NumPy array manipulation to access data and subarrays and to split, reshape, join arrays etc. **(K3)**

Detailed content of the unit: - Introduction to NumPy, ndarray, datatypes, array attributes, array creation routines, Array from Existing Data, Array from Numerical Ranges, Indexing & Slicing.

References: - 1) Python Programming- A modular Approach (with Graphics, database, Mobile and Web Applications by Sheetal Taneja and Naveen Kumar, Pearson.
2) Head First Python by Paul Berry, O'Reilly
3) Dive into Python by Mark Pilgrim, APress
4) Beginning Programming with Python Dummies by John Paul Meuller.
5) Programming and Problem Solving Through Python Language, Prof. Satish Jain, Shashi Singh, BPB Publication.

OR

SCRIPTING LANGUAGE(PERL)

(For all branches except Computer Science & Technology)

Course Code	CSOE508
Course Title	Scripting Language(Perl)
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Knowledge of Programming and Linux
Course Category	Open ElectiveCourse

Course Outcomes: -
After the completion of the course Student will be able to
1) The fundamentals to create functional Perl scripts **(K1)**.
2) Know about data structures, flow control mechanisms, regular expressions, and subroutines and modules. **(K2)**
3) Know about the usage of Database Access using Perl. **(K3)**

Course Content:-

Module- 1: An Overview of Perl

Number of class hours: 06 Hrs

Suggestive Learning Outcomes:
1) Understand features and structure of Perl. **(K1)**
2) Understand the areas where Perl is used. **(K1)**
3) Understand the uses of Filehandles, Operators, Control Structures, Regular Expressions. **(K3)**

Detailed content of the unit: - Perl Introduction, Perl Environment, Perl Installation, Natural and Artificial Languages, A Grade Example, Filehandles, Operators, Control Structures, Regular Expressions, List Processing

Module- 2: The Gory Details

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:
1) Use the basic operators and expressions available in Perl in developing program. **(K2)**
2) Understand and use various subroutines, formats in writing Perl program. **(K3)**
3) Work with various built-in datatypes and their use **(K3)**
4) Understand the concept of pattern matching, variables and hashes. **(K2)**

Detailed content of the unit: - Lexical Texture, Built-in Data Types, Terms, Pattern Matching, Operators, Statements and Declarations, Subroutines, Formats, Special Variables, Hashes

Module- 3: References and Nested Data Structures

Number of class hours: 08 Hrs

Suggestive Learning Outcomes:
1) Understand the concept of References, Braces, Brackets, and Quoting, **(K2)**
2) Understand the concept of lists and data structure codes. **(K3)**

Detailed content of the unit: - About Reference, Creating Hard References, Using Hard References, Symbolic References, Braces, Brackets, and Quoting, Manipulating Lists of Lists, Data Structure Code Examples.

Module- 4: Functions, Packages, Modules, and Object Classes

Number of class hours: 08 Hrs

Suggestive Learning Outcomes:
1) Work on Understand the concept of Functions. **(K2)**
2) Understand the concept of Modules. **(K2)**

3) Understand the concept of Object, Instance variables. **(K1)**
4) Understand the concept of Packages. **(K1)**

Detailed content of the unit: - Perl Functions by Category, Perl Functions in Alphabetical Order, Packages, Modules, Objects, Perl's Objects, Brief Refresher on Object-Oriented Programming, Using Tied Variables, About Object Design, Instance Variables, Containment, Implementation, Delegation,

Module- 5: Database Access

Number of class hours: 08 Hrs

Suggestive Learning Outcomes:
1) Understand the concept of Database file. **(K3)**
2) Understand the concept of SQL Command Using DBI and DBD. **(K3)**

Detailed content of the unit: - Making and Using a DBM File, Emptying a DBM File, Converting Between DBM Files, Merging DBM Files, Locking DBM Files, Sorting Large DBM Files, Executing an SQL Command Using DBI and DBD

References: -
1) Programming Perl by Larry Wall, Tom Christiansen, & Randal Schwartz; O'REILLY.
2) Learning Perl by Tom Phoenix, Randal L. Schwartz, O'REILLY.
3) Perl Cookbook by Tom Christiansen, Nathan Torkington, O'REILLY.
4) Perl: The Complete Reference by Martin C Brown, McGraw-Hill

MULTIMEDIA & ANIMATION TECHNIQUES

(For all branches except Information Technology)

Course Code	ITOE508
Course Title	Multimedia & Animation Techniques
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	----
Course Category	Open Elective Course

Course Outcomes: -Upon completion of the course the students will be able to:

1) Describe the concepts of designing and developing multimedia **(K2)**
2) Use the various data compression techniques **(K3)**
3) Design and develop multimedia solutions **(K3)**
4) Describe the basics of graphics and image data representations **(K2)**
5) Use programming in interactive multimedia development **(K3)**

Course Content:-

Module- 1: Introduction to Multimedia

Number of class hours: 5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) List the components of multimedia
2) Recognize different multimedia hardware and software
3) Describe multimedia communication system

Detailed content of the unit: - Multimedia Foundation and Concepts: Multimedia Hardware, Multimedia Software, Multimedia operating systems, Multimedia communication system.

Module- 2: Basic Compression Techniques

Number of class hours: 5 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Discuss various video and audio data compression techniques.
2) List different data compression algorithms/standards.
3) Use different video and audio data compression Techniques

Detailed content of the unit: - Video and Audio Data Compression Techniques – Lossy and Lossless. Example algorithms/standards: Huffman, RLE, JPEG, MPEG, MP3, MP4, LZMA, FLAC, ALAC, ITU G.722, H.261, H.265.

Module- 3: Content Development and Distribution

Number of class hours: 6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Use different desktop publishing software
2) Develop multimedia animations
3) Use multimedia distribution techniques

Detailed content of the unit: - Desktop publishing (Coral Draw, Photoshop, Page maker) Multimedia Animation & Special effects (2D/3D animation, Flash).

Module- 4: Introduction to Digital Imaging

Number of class hours: 6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Describe the concepts of representing image in Computer Systems
2) Recognize different types of digital images
3) Use of digital Images in multimedia

Detailed content of the unit: - Basics of Graphic Design and use of Digital technology, Definition of Digital images, Digital imaging in multimedia.

Module- 5: Introduction to Multimedia Programming and Animation

Number of class hours: 7 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-
1) Use appropriate programming language for developing multimedia
2) Write program to develop interactive multimedia solutions
3) Test multimedia applications and fix bugs arise

Detailed content of the unit: - Basic programming concepts, HTML basics, Java Scripts for interactive website Development, Programming in Micromedia Flash.

 References: -
1) An Introduction to Multimedia Authoring, A. Eliens
2)Fundamentals of Multimedia, Prentice Hall/Pearson, Ze-Nian Li &MarkS. Drew
3) Multimedia and Animation, V.K. Jain, Khanna Publishing House, Edition 2018.
4) Fundamentals of Multimedia, Ramesh Bangia, Khanna Book Publishing Co., N. Delhi (2007)

ROBOTICS

(For all branches except Mechanical Engineering)

Course Code	MEOE 611/ A
Course Title	Robotics
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	Nil
Course Category	Open elective course

Course Outcomes: - By the end of the course, the students are expected to

CO1: Explain robot anatomy, classification, characteristics of robot.**(K1)**
CO2: Explain the various robotic actuators on hydraulic, pneumatic and electrical drives.**(K2)**
CO3: Describe various types of sensors and concepts on robot vision system.**(K2)**
CO4: Explain the concepts of robot programming languages**(K2)**
CO5: Understand to adopt robot to various industrial applications.**(K1)**

Course Content:-

Module- 1: Fundamentals of Robotics

Number of class hours: 8Hrs.

Suggestive Learning Outcomes:

1) Know the basic concepts of robots.
2) Understand the robot components.
3) Know the effects of structure on control work envelope and work volume.
   .

Detailed content of the unit: -

Introduction; Definition; Robot anatomy (parts) and its working; Robot Components: Manipulator, End effectors; Construction of links, Types of joints; Classification of robots; Cartesian, Cylindrical, Spherical, Scara, Vertical articulated; Structural Characteristics of robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume; Robot work Volumes, comparison; Advantages and disadvantages of robots.

Module- 1I: Robotic Drive System and Controller

Number of class hours:8 Hrs.

Suggestive Learning Outcomes:

1) Familiar with the various drive systems for robot
2) Understand the robot controller
3) Describe various types of path control

Detailed content of the unit: -

Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives; AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion; Feedback devices; Potentiometers; Optical encoders; DC tachometers; Robot controller; Level of Controller; Open loop and Closed loop controller; Microprocessor based control system; Robot path control: Point to point, Continuous path control and Sensor based path control; Controller programming.
.

Module- 1II: Sensors

Number of class hours:8 Hrs

Suggestive Learning Outcomes:

1) Explain the purposes of a sensor in robot.
2) Describe the application of various types of sensors.
3) Understand the applications of robot vision system.

Detailed content of the unit: -

Requirements of a sensor; Principles and Applications of the following types of sensors: Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach); Proximity sensing; Force and torque sensing. Introduction to Machine Vision: Robot vision system (scanning and digitizing image data); Image processing and analysis; Cameras (Acquisition of images); Videocon camera (Working principle &construction); Applications of Robot vision system: Inspection, Identification, Navigation & serving.

Module- 1V: Robot kinematics and Robot Programming

Number of class hours:8 Hrs

Suggestive Learning Outcomes:

1) Differentiate between forward kinematics and reverse kinematics of manipulators.
2) Explain deviations and problems.
3) Understand the basics of robot programming languages.

Detailed content of the unit: -

Forward Kinematics; Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two Degrees of Freedom (In 2 Dimensional); Deviations and Problems. Teach Pendant Programming; Lead through programming; Robot programming Languages; VAL Programming; Motion Commands; Sensor Commands; End effecter commands; and Simple programs.

Module- V: Robot Applications in Manufacturing

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

1) Describe the application of robot in material handling, machine tool loading and unloading and in various types of welding.
2) Know the requisite and non requisite robot characteristics.
3) Describe the safety considerations and social implications for robot operations.

Detailed content of the unit: -

Robot applications – Material handling – Press loading and unloading – Die casting – Machine tool loading and unloading -Spot welding – Arc welding – Spray painting – Assembling -Finishing – Automatic Guided Vehicle – Adopting robots to workstations – Requisite robot characteristics and Non requisite robot characteristics – Stages in selecting robots for industrial applications – Safety considerations for robot operations – Robotics in the future and characteristics task- Economical analysis of robots – Social implications

Reference Books:
1. Introduction to Robotics: Analysis, Systems, Applications – Saeed B. Niku, Pearson EducationInc. New Delhi 2006.
2. Industrial Robotics: Technology, Programming and Applications – M.P. Groover, Tata McGrawHill Co, 2001.
3. Robotics Control, Sensing, Vision and Intelligence – Fu.K.S. Gonzalz.R.C and Lee C.S.G, Mc-Graw Hill Book Co, 1987.
4. Robotics for Engineers – Yoram Koren, McGraw Hill Book Co, 1992.
5. A Text book on Industrial Robotics – Ganesh S. Hedge, Laxmi Publications Pvt. Ltd., New Delhi,2008.
6. Elements of Robotics Process Automation, Mukherjee, Khanna Publishing House, Delhi, 2018

Environmental Pollution and Control

(For all branches except Automobile Engineering)

Course Code	AEOE 508
Course Title	Environmental Pollution and Control
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	Programme elective course-2

Course outcomes:-

After completing this course, student will be able to:

1) Know the global importance of clean environment.
2) Classify the pollutants.
3) Know the sources of pollutants.
4) Understand effect of pollutants on environment & economy.
5) Knowaboutenvironment&controlacts&ISO14000standards & Operate pollution control devices.

Course Contents:

Module - I: Introduction

Number of class hours: 05

Suggestive Learning Outcomes:
1. Understand the importance of clean environment.
2. Know about the control acts & ISO 14000 standards.

Detailed content of the unit:
Environment, Ecosystem, Classification of pollution & pollutants, Environment & pollution control acts, ISO14000standards, Kyototreaty/protocol, carbonunits.

Module - II: AirPollution

Number of class hours: 05

Suggestive Learning Outcomes:
1.Describe the classification of pollutants.
2. Know the causes of pollution due to Automobile design.

Detailed content of the unit:
Sources & classification of air pollution, Effects of air pollution on human health, Effects of airpollution on economy, Photochemical airpollution, Air pollution from major Industrial

operations e.g. Fertilizer industries aluminium manufacturing plants, Acidplants,Cementindustries,Coal&tarindustries,paperindustries,Refinery&petrochemicalindustries.Air pollution due to Automobiles-design and operating parameters and methods of control Pollution due to S. I. Engines, Design & operating parameters responsible for emission and methodsofpollutioncontrol.PollutionduetoC.I.Engines.Design&operatingparametersresponsibleforemissionandmethodsofpollutioncontrol.Airquality&emissionstandardsofIndia&Europe. Airpollution in Indian metro cities-Delhi, Mumbai, Chennai, Kolkata

Module - III: WaterPollution

Number of class hours: 05

Suggestive Learning Outcomes:
1. Analyse the causes & effects of water pollution.
2. Describe the steps of water treatment.

Detailed content of the unit:

Sources of waterpollution: Effects of waterpollution. Waterpollutionanalysis,Physicalexaminationofwater.Chemicalcharacteristicsofwater, Biologicalinvestigationofwater.DefinitionsofImportanttermsusedinwaterpollution– Dissolved0_2 .Chemical0_2demand, Biological 02 demand, Theoretical 02demand,Total solids, Total suspended solids,Totaldissolvedsolids,Turbidity,Alkalinity,Acidity,Waterquality standards, Stepsin Watertreatment, Sampling & analysis of waterpollution.

Module - IV: Noise Pollution

Number of class hours: 04

Suggestive Learning Outcomes:
1. Describe the types of noise pollution.
2. Know the effects of noise pollution on health.

Detailed content of the unit:

Definitionofnoise. Sources of noise. Types of noise –Impulsive & sonic noise. Effects of noise on health. Noise measurement. Noise mapping.

Module - V: Other Types of Pollution

Number of class hours: 05

Suggestive Learning Outcomes:
1. Define the causes of soil, chemical pollution.
2. Understand Greenhouse effect & Acid rain & Ozone depletion.

Detailed content of the unit:

Solid waste:

Classificationofsolids,Solidwastemanagement,Methodofsolidwastedisposal,Reuse,Recycling& recoveryofmaterialsfromrefuse,Soilpollution, Chemistry of soil, Soilirrigation**by**effluents. Agricultural pollution, Radiation pollution, Sources&effectsofradiation,Radiationexposurestandards,Radiationprotection,Treatment& disposalofradiation waste.

Global pollution

Green house effect. Acid rain. Ozone depletion problem.

References: -

6) M.N.Rao&H.V.N.Rao, "Airpollution" TataMcGrawHill.
7) P.Meenakshi, "ElementsofEnvironmentScience&Engineering" Prentice-Hall.
8) S.Deswal&A.Deswal, "Abasiccourseinenvironmentalstudies" DhanpatRaiandSons.

HISTORY OF INDIAN ARCHITECTURE

(For all branches except Architectural Assistantship)

Course code	AROE 508
Course title	History of Indian Architecture
Number of Credits	
Prerequisites	Nil
Course Category	Open Elective

Objective:
●   To provide an insight into the architecture of early civilizations of India
●   To understand the development process of architecture from ancient times.
●   To learn how the Social, religious and political character, construction methods, building materials and climate have influenced the built form and settlement patterns of India.

Expected Course outcome: By the end of the course, the students are expected

CO-1: To understand the evolution of architecture (K1)
CO-2: To identify the various type of Architecture in India (K2)
CO-3: To summarize the governing factors influencing the architectural development (K2)
CO-4: To compare the primary construction techniques developed in different times (K2)
CO-5: To be able to explain various ornamentation and built forms through sketches. (K3)

Module-1:- Primitive Architecture; Introduction to ancient Indian architecture; Mansara Shilpa shastra and settlement planning; Indus Valley civilization; Architecture and town planning of Harappa, Lothal, Mohenjo-Daro, Kalibanga etc. Understanding of Vedic architecture and settlements.

Number of class hours: 4
Suggestive Learning Outcomes
1) Student will be introduced to primitive architecture
2) Student will learn about the elements of planning of ancient time.
3) Students will understand the initial stages of Architectural development in ancient India.

Module 2:- Outline of Buddhist architecture, Architectural examples of Mahayana and Hinayana period; Rock-cut and free standing. Study of caves, stupas, and viharas of places like Sanchi, Amravati etc. Medieval Jain-temple architecture of western India.

Number of class hours: 6
Suggestive Learning Outcomes
1) Student will be introduced to the philosophies and forms of Buddhist and Jain Architecture.
2) Student will be able to distinguish the unique characteristics of rock-cut architecture.

Module 3:- Study of chronological development of Hindu architecture, Early examples of monolithic and rock-cut architecture. Classification of Hindu Temples; Characteristic features of Indian temple architecture for form, plan, *shikhara*, pillars, decoration, sculpture, master-planning etc.

Number of class hours: 8
Suggestive Learning Outcomes

1) Student will be introduced to the various regional concepts of temple architecture
2) Student will be able to learn the techniques and usage of appropriate materials in construction

Module 4:- History of Islam and its principles – Advent of Islam into the Indian subcontinent-architectural character of the Indo-Islamic style- Development of basic mosque and tomb prototypes;-Imperial style, Delhi Sultanate, Pre-Mughal regional Architecture, Mughal Architecture.

Number of class hours: 6
Suggestive Learning Outcomes
1) Student will be introduced to the indo-Islamic styles spread over different region in India.
2) Student will be able to apply the forms and features of Islamic Architecture in design process.

Module 5:- English, French, Dutch and Portuguese Colonial architecture in Indian subcontinent. Post-Independence architecture and planning examples and Important architectural works in India.

Number of class hours: 8
Suggestive Learning Outcomes
1) Student will be introduced to the foreign contribution on Indian architecture.
2) Student will be able to learn the features of modern Cities.
3) Student will be introduced to the important and iconic structures of India.

References:

● Percy Brown, Indian Architecture (Buddhist and Hindu period)
● Brown Percy, Indian Architecture (Islamic Period).
● Satish Grover, The Architecture of India (Buddhist and Hindu period)
● Satish Grover, The Architecture of India (Islamic)
● Nath – History of Mughal Architecture
● Banister Fletcher, History of Architecture
● G. K. Hiraskar,The great ages of World Architecture

Food Laws and Regulations

(For all branches except Food Processing Technology)

Course Code	FPOE508
Course Title	**Food Laws and Regulations**
Number of Credits	03
Prerequisites	Nil
Course Category	Open Elective-1

Course Outcomes: -

1. Study the fundamentals of food laws. (K1)
2. Describe food safety and standard. (K2)
3. Illustrate the details of regulation and licensing. (K3)
4. Understand the basics of relevant acts. (K2)
5. Discuss the details of various laws. (K2).

Course Content:

Module - 1:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know food laws.
2. Students will be able to discuss the types of laws.

Detailed content of the unit :

Introduction

Food Laws and Regulations, Need for food standards and their enforcement, various types of laws (Mandatory/Regulatory and Voluntary/Optional).

Module - 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will know about food safety and standards.
2. Students will be able to illustrate the importance of food safety.

Detailed content of the unit :

Food Safety and Standards

Food Safety and Standards Authority of India (FSSAI), Food Safety and Standards Act, 2006 (FSSA) – inception, importance and significance, discussion on important sections.

Module - 3:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to describe licensing and registration.
2. Students will be able to discuss packaging and labelling.

Detailed content of the unit:

FSS Regulations

Regulations on Licensing and Registration, Regulations on Contaminants, toxins and residues, FSS Regulations on Food product standards and food additives, FSS Regulations on Laboratory and sampling analysis; FSS Regulations on Packaging and Labelling; FSS Regulations on Prohibition and Restriction on sales.

Module - 4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to know the basic of relevant acts.
2. Students will be able to discuss the details of acts.

Detailed content of the unit:

Relevant Acts

Environment (Protection) Act, 1986, Standards of Weights and Measures Act, 1976, Essential Commodities Act, 1955, The Export (Quality Control and Inspection) Act, 1963, The Insecticides Act, 1968, Consumer Protection Act, 1986.

Module - 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know the fundamentals of various food laws.
2. Students will be able to discuss types of standards.

<u>Detailed content of the unit</u> :

Introduction to various food laws

Agmark Standards (AGMARK), Codex Alimentarius Standards, BIS Standards and Specifications,GMP Regulations, Licensing and registration process.

References:
1. Food Safety and Standards Act, 2006FSSAI, New Delhi
2. The Food Safety and Standards Act, 2006 (Along with Rules & Regulations) Commercials Law Publications, New Delhi
3. TAXMANN's Guide to Food Safety and Standards Act 2006Taxmann's Publication
4. Food Safety and Standards Act, Rules &Regulations,Vidhi Jain Akalank Kumar Jain

Nanotechnology
(For all branches except Medical Laboratory Technology)

Course Code	MLOE508
Course Title	**Nanotechnology**
Number of Credits	03
Prerequisites	Nil
Course Category	Open Elective-1

Course Outcomes: -

1. Students will be able to understand applications of atomic structure in nanotechnology.
2. Students will be able to know surface science and different types of nano-structures.
3. Students will be able to know application of nano-materials.

Course Content:-

Module- 1: Basics of Quantum Mechanics and Atomic Structure

Number of class hours: 03hrs

Suggestive Learning Outcomes:

1. Students will be able to understand basics of atomic structure.
2. Students will be able to know applications of atomic structure in nanotechnology.
3. Students will be able to know formation of nano-materials.

Detailed content of the unit: -

Duality of light, de Broglie waves, electrons in potential well, structure of hydrogen atom, classic atomic bonding, LCAO theory, band theory, energy bands for metals, semi-conductors and insulators

Module- 1I: Surface Science of Nanomaterials

Number of class hours: 03hrs

Suggestive Learning Outcomes:

1. Students will be able to understand surface science of nano-materials.
2. Students will be able to know various aspects of nano-materials.
3. Students will be able to know aspects of nanomaterials.

Detailed content of the unit: -

Crystal structure, close packed structures – FCC, HCP and BCC, surface structure for close-packed surfaces, surface reconfiguration (surface relaxation & surface reconstruction) adsorption, wetting, surface area in nanomaterials

Module- 1II: Introduction to Nanostructures

Number of class hours: 03hrs

Suggestive Learning Outcomes:

1. Students will be able to understand basics of nano-structures.
2. Students will be able to know various types of nano-structures.
3. Students will be able to know various components of nano-structures.

Detailed content of the unit: -

Carbon nanotubes (CNT), fullerene ('C60'), quantum dots and semiconductor nanoparticles, metal-based nanostructures, nanowires, polymer-based nanostructures, gold nanostructures.

Module- 1V: Nanomaterial Characterization

Number of class hours: 03 hrs

Suggestive Learning Outcomes:

1. Students will be able to understand basics of characterisation of nanomaterials.
2. Students will be able to know various instruments for characterisation of nanomaterials.
3. Students will be able to know different components of characterisation of nanomaterials.

Detailed content of the unit: -

Brief study of X-ray diffraction, electron microscopy, interaction between electron beam and solids, TEM, SEM, SPM (STM & AFM), AES, XPS, SIMS

Module- V: Nano biomaterials

Number of class hours: 03hrs

Suggestive Learning Outcomes:

1. Students will be able to know various types of nano-biomaterials.
2. Students will be able to understand significance of nano-biomaterials.
3. Students will be able to know various applications of nano-biomaterials.

Detailed content of the unit: -

Biomimetic nanotechnology, protein-based nanostructures, Nano motors, bacterial (E. coli) and mammalian (Myosin family), DNA nanotechnology, nanostructures in cells study, proteins biochips applications in nano scale detection, tissue engineering.

Module- VI: Nanotechnology in Biomedical and General Application

Number of class hours: 04hrs

Suggestive Learning Outcomes:

1. Students will be able to know various types of nanomaterials.
2. Students will be able to understand significance of nanomaterials.
3. Students will be able to know various applications of nanomaterials.

Detailed content of the unit: -

Micro- and Nano electromechanical devices in drug delivery, other applications in drug delivery, targeted drug administration, Nano-sensors, applications of quantum dots, nano-chips in computer and electronics, nano-materials in cosmetic, paint, sensors, environmental application and general application.

<u>References</u>

1. Fundamentals and applications of nanomaterials by Guo Z and Tan L, Artech house (2009).
2. Nanobiotechnology by Balaji S, MJP Publishers (2010).
3. Nanobiotechnology: concepts, applications and perspectives by Niemeyer CM and Mirkin CA, Wiley-VCH (2004).
4. Introduction to Nanoscience by Lindsay SM, Oxford University Press (2010).

Fashion Illustration

(All branches accept Fashion Technology)

Course Code	FTOE-508
Course Title	Fashion Illustration
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	
Course Category	Open elective course-1

Course Outcomes: - 1) To learn about basic drawing techniques..

2) Idea about human anatomy structure.

3) Knowledge on sketching of different garment parts.

4) Gaining idea about various costume drawings. .

5) Gaining idea about colour wheels and selection of colours..

.

Module- 1: Introduction to Fashion Illustration
Number of class hours: 2 hours.

Suggestive Learning Outcomes:
 1) To learn about preparatory process of sketching.
 2) To gain idea about different colours.

Changes in fashion Illustration styles and proportion over the centuries .Introduction to various colourmediums-postercolour,watercolour,crayons,waterproofing,pencil&pens.Differenttypes of prints and their affects when draft into dresses-plain,striped,checks,textured,floralillustrationwithpencilandcolour.

Module- 2: Basic gesture drawing

Number of class hours: 2 Hours

Suggestive Learning Outcomes:
 1) To learn about different figure poses
 2) To gain idea about human body and its parts.
Make stick figures in different poses, Make geometric figures, Blocking the human body and studying the different body parts in details.

Module-3: Proportion
Number of class hours: 4 Hours

Suggestive Learning Outcomes: 1) Gaining knowledge on different techniques of illustration.

2) Learn about faces, hair styles, accessory designs
Study of types and techniques of illustrations
Study of Basic Anatomy.

Constant proportions – children, men, women in various poses.
Drawing faces and hairstyles, Drawing arm sandlegs with accessories, creating various poses.

Module-4 :Illustration Fashion figure

Number of class hours: 3 Hours

Suggestive Learning Outcomes:
      1) Gaining knowledge on colour figures.
      2) Learn about different methods of garment design
Illustrateincolourfigureswithdressesindifferenttypesoffabric,illustratedressesforchildren,womenandmen.
Whatisdesign?Howtodesign?Presentationtechnique-
Flatsketches,Portfolio.Garmentdesigndetailsforchildren,womenandmen.

Module- 5: Drawing

Number of class hours: 5 Hours

Suggestive Learning Outcomes:
1) Gaining knowledge on silhouette.
      2) Learn about different types of garment parts
Silhouette and its type.
Drawing & study of different types of necklines, collars, sleeves and cuffs, drawing skirt, pants and coats.
Drawing blouses, shirts.

References: -

    1. Dress selection and design, Harion Hillhouse.

    2. Visual design, Goldstein and Goldstein.

    3. Art in everyday life, M.F. Hepbirth / Eng. Uni. Press. Ltd.

    4. Dress Designing, J.R. Garbth.

    5. How to draw Human Figures, Sharan Lee Tata, Mona.

   6. Complete Book of fashion Illustration Shafer Eduardis Hepper and Raw.

ENGINEERING ECONOMICS & ACCOUNTANCY

(COMMON For ALL BRANCHES)

Course Code	:	HSOE 508/A
Course Title	:	ENGINEERING ECONOMICS & ACCOUNTANCY
Number of Credits	:	3 (L:3,T:0,P:0)
Prerequisites	:	NIL
Course Category	:	OE

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Understand the basic concept of economics.
CO2	Interpret the concept of demand - supply interaction, theory of production and pricing.
CO3	Demonstrate the understanding of accountancy and basic concepts of business transaction.
CO4	Interpret Cost Sheets and Cash Book for decision making.
CO5	Analyze various financial statements.

Course Content:

Module 1: BASIC CONCEPTS OF ECONOMICS

Intended Learning Outcomes:

(a) Describe the Basic Concepts of Engineering Economics
(b) Acquire Knowledge on Demand and its Various Affecting Elements

Managerial Economics; Relationship with other disciplines; Firms: Types, objectives and goals; Managerial Decisions, Problems of scarcity of resources and alternative uses of resources, Basic problems of Economics, Definition of Demand, Factors affecting Demand, Law of Demand and its Exceptions, Demand Schedule, Demand Curve, Supply, Supply Curve, Factors affecting Supply, Supply Schedule.

Module 2: DEMAND-SUPPLY INTERACTION, THEORY OF PRODUCTION & PRICING

Intended Learning Outcomes:

(a) Interpret the Determinants of Price and Price Elasticity
(b) Differentiate between Movement along the Demand Curve and Shift of Demand Curve and Arc and Point Elasticity

Demand: Difference between movement along the demand curve and shift of demand curve, Price Elasticity of Demand: Arc & Point Elasticity, Determinants of Price Elasticity, Demand Forecasting, Estimating Demand Trend using Least Square Method, Interaction of Demand Supply and Equilibrium Price determination, Simple Exercises on Price Elasticity of Demand, Determinants of Price; Pricing under different objectives and different market structures, Pricing methods in practice.

Module 3: INTRODUCTION TO ACCOUNTANCY & BASIC CONCEPTS OF TRANSACTION

Intended Learning Outcomes:

(a) Describe the Basic Concepts of Accountancy
(b) Distinguish between Single and Double Entry, Journal and Ledger and B/d & C/d

Accountancy: definition & objectives-book keeping & Accountancy, Single & Double Entry System. Difference between Single & Double Entry System, Accounts, Transaction two aspects, Events, Golden Rules, Journal as a book of Prime Entry Recording of Transaction in Journal, Narration, Ledger: Rules for writing Ledger, Balancing of Ledger Accounts, Concept of B/d and C/d.

Module 4: CASH BOOK & ELEMENTS OF COST SHEET

Intended Learning Outcomes:
(a) Determine Cost with the help of Cost Sheet
(b) Distinguish between different Types of Cash Book

Single Column , Double Column and Triple Column including Contra Entry, Determination of Cost with the help of Cost Sheet, Machine Hour Rate.

Module 5: TRIAL BALANCE & FINAL ACCOUNT

Intended Learning Outcomes:

(a) Compile Trial Balance, Trading Account and Profit & Loss Account
(b) Analyze Trial Balance and Balance Sheet

Preparation of Trial Balance, Rectification of a wrong Trial Balance, Trading Account, Profit & Loss Account, Balance Sheet (simple adjustment).

ReferenceBooks:

1. PremvirKapoor,Sociology&EconomicsforEngineers,KhannaPublishingHouse,New Delhi,2018.

2. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics',ThomsonSouthWestern, 10th Edition,2005.

3. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill PublishingLtd.,4th edition, 2005.

4. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing CompanyLimited,New Delhi, 2004.

5. PareshShah,'BasicFinancialAccountingforManagement',OxfordUniversityPress, New Delhi,2007.3.SalvatoreDominick,'ManagerialEconomicsinaglobaleconomy'.Thoms onSouthWestern,4th Edition, 2001.

6. Managerial economics, Maheshwari, Prentice Hall of India Pvt. Ltd.

7. Engineering Economics, Dhanasekaran et.al, Scitech.

8. Financial Accounting: Concepts , Analysis, Methods And Uses, Banerjee, Prentice Hall Of India Pvt.Ltd.

9. Business Economics, H L Ahuja, S Chand and Company Ltd.

10. Essentials of Financial Accounting, Bhattacharya.

11. Accounting for Management, N.P. Srinivasan & Sakthivel Murugan, S Chand Publishing.

12. Financial Accounting (Principles and Practice), Jawahar Lal & Seema Srivastava,S Chand Publishing.

History of Science & Engineering

(Common for all branches)

Course Code	:	HSOE-508/B
Course Title	:	History of Science & Engineering
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites (Course code)	:	NIL
Course Category	:	OE

Course outcomes:

After completion of this course students will be able to:

a) Understand the connection of Science and technology with society .(K2)

b) Analyze the development of science and engineering and interpret the statistical data to understand the growth of science and engineering .(K4)

c) Interpret the role of research & development in India.(K2)

d) Discover the development of science and engineering in different areas. (K3)

e) Analyze the methods of technological transfer .(K4)

Module 1: Historical Perspective (6 Hours)

Suggestive Learning Outcome:

1. **Describe the evolution of science and engineering (K1)**

2. **Extract the motivation behind the growth of science and engineering. (K2)**

The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences. Biography of Isaac Newton, Einstein, Thomas Edison, Alfred Nobel, M. Visvesvaraya.

Module 2: Policies, Plans and Statistical profile of science & engineering profession

(8 Hours)

Suggestive Learning Outcome:

1. **Discover the role of different policies and plans for the development of science & engineering in India. (K3)**

2. **Correlate the status of science and engineering from the statistical data. (K4)**

Science and technology developments in the new era. After independence Science and technology developments during the Five-Year Plan Periods and science and technology

policy resolutions. College enrolment trends of science and engineering students, college majors of recent science & engineering students. Job placement trends, diversity of profession distribution of scientist and engineers by type of employer.

Module 3: Research and Development (R&D) in India (6 Hours)

Suggestive Learning Outcome:

1. **Classify the different R & D activities. (K2)**

2. **Infer the role of R & D for the growth of science and engineering. (K2)**

Expenditure in R&D, Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self-reliance, activities of council of scientific and industrial research (CSIR).

Module 4: Science and Technological Developments in Major Areas (10 Hours)

Suggestive Learning Outcome:

1. **Discover the major areas of development of science and engineering. (K3)**

2. **Recognize the key areas of development of science and engineering in India. (K1)**

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology
Ocean Development – Objectives of ocean development, Biological and mineral resources, Marine research and capacity building
Defence Research – Spin-off technologies for civilian use,
Biotechnology – Applications of biotechnology in medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of biosensors and animal husbandry
Energy – Research and development in conservation of energy, India's nuclear energy program, technology spin-offs.

Module 5: Nexus between Technology Transfer and Development (10 Hours)

Suggestive Learning Outcome:

1. **Categorize the ways of technological transfer. (K4)**

2. **Cite the opportunities and obstacles in the path of technological change. (K2)**

Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Textbooks:
1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58.
2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.

Reference Books:
1. Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Developlemnt, K., Nayudamma Memorial Science Foundation, Chennai – 8.
2. Kohili, G.R., The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.
3. Government of India, Five Year Plans, Planning Commission, New Delhi.
4. Sharma K.D., and Quresh M.A., Science, Technology and Development, Sterling Publications (P) Ltd., New Delhi.

5. Pattern of Enrolments at Different Educational Levels. Vipan Kumar, Naresh Kumar and Neelam Kumar.

Annexure- II

(Open Elective Subjects)

For 6th Semester Only

Sl. No.	Subject	Code	Offered By the Department
1	Project Management	CEOE-605	Civil Engineering
2	Industrial Automation	EEOE-605	Electrical Engineering
3	Principles of Electronic Communication	ECOE-605	Electronics & Telecommunication
4	Artificial Intelligence	CSOE-605	Computer Science & Technology
5	Management Information System	ITOE-605	Information Technology
6	Operations Research	MEOE-605	Mechanical Engineering
7	Automobile Chassis	AEOE-605	Automobile Engineering
8	Energy Efficient Architecture	AROE-605	Architectural Assistantship
9	Food Chemistry and Nutrients	FPOE-605	Food Processing Technology
10	Green Biotechnology	MLOE-605	Medical Laboratory Technology
11	Garment Designing & Draping	FTOE-605	Fashion Technology
12	Economic Policies in India	HSOE- 605/A	Science & Humanities
13	Classical Text Reading	HSOE-605/B	Science & Humanities

PROJECT MANAGEMENT

(For all branches except Civil Engineering)

Course Code	:	CEOE 605
Course Title	:	PROJECT MANAGEMENT
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	OE

Course outcomes:

After competing this course, student will be able to:

- CO 1. Discover the importance of projects and its phases.(K3)
- CO 2. Analyze projects from marketing, operational and financial perspectives.(K4)
- CO 3. Compute projects based on discount and non-discount methods.(K3)
- CO 4. Model network diagrams for planning and execution of a given project.(K4)
- CO 5. Apply crashing procedures for time and cost optimization(K3)

Detailed Course Content

Module-I: Concept of a project

Number of Class hours: 08

Learning Outcomes:

1. Classification of projects- importance of project management(K2)
2. Identify the project life cycle(K2)
3. Discover the project priorities(K3)
4. Outline the work break down structure(K1)

Detailed content of the unit:

1.1 Classification of projects- importance of project management.

1.2 The project life cycle establishing project priorities (scope-cost-time)

1.3 Project priority matrix

1.4 Work break down structure.

Module-II: Capital budgeting process:

Number of Class hours: 08

Learning Outcomes:

1. Define, Planning-Analysis-Selection-Financing-Implementation-Review.(K1)
2. Generation and screening of project ideas- market and demand analysis(K2)
3. Identify the demand forecasting techniques.(K2)
4. Illustrate the Market planning and marketing research process-Technical analysis(K4)

Detailed content of the unit:

2.1 Planning- Analysis-Selection-Financing-Implementation-Re- view.
2.2 Generation and screening of project ideas- market and demand analysis
2.3 Demand forecasting techniques.
2.4 Market planning and marketing research process-Technical analysis

Module-III: Financial estimates and projections

Number of Class hours: 08

Learning Outcomes:

1. Discover the Cost of projects-means of financing-estimates of sales and production.(K3)
2. Discover the Cost of production-working capital requirement and its financing-profitability projected cash flow statement and balance sheet.(K3)
3. Identify the Break evenanalysis.(K2)

Detailed content of the unit:

3.1 Cost of projects-means of financing-estimates of sales and production
3.2 Cost of production-working capital requirement and its financingprofitability projected cash flow statement and balance sheet.
3.3 Break even analysis.

Module-IV: Basic techniques in capital budgeting

Number of Class hours: 08

Learning Outcomes:

1. Categorize the Non discounting and discounting methods- pay- back period(K4)
2. Estimate the Accounting rate of return-net present value-Benefit cost ratio-internal rate of return(K2)
3. Identify the Project risk.(K1)
4. Discover the Social cost benefit analysis and economic rate of return.(K3)
5. Discover the Non-financial justification of projects.(K3)

Detailed content of the unit:

4.1 Non discounting and discounting methods- pay- back period
4.2 Accounting rate of return-net present value-Benefit cost ratio-internal rate of return.
4.3 Project risk.
4.4 Social cost benefit analysis and economic rate of return.
4.5 Non-financial justification of projects**.**

Module-V: Project administration

Number of Class hours: 08

Learning Outcomes:

1. Discover the progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM)(K3)
2. Generalize the schedule of payments and physical progress, time-cost tradeoff.(K2)
3. Identify the ConceptsandusesofPERTcostasafunctionoftime,ProjectEvaluationandReviewTechniques/cost mechanisms.(K1)
4. Identification of least cost duration. Post project evaluation. Introduction to various Project management software.(K1)

Detailed content of the unit:

5.1 Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM)
5.2 Schedule of payments and physical progress, time-cost tradeoff.
5.3 Concept sand uses of PERT cost as a function of time
5.4 Project Evaluation and Review Techniques/cost mechanisms.
5.5 Determination of least cost duration.
5.6 Post project evaluation. Introduction to various Project management software.

Reference Books:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGrawHill

2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson - McGraw Hill

3. Project management - David I Cleland - Mcgraw Hill International Edition,1999

4. Project Management – Gopala krishnan – McmillanIndiaLtd.

5. Project Management-Harry-Maylor-PeasonPublication

Industrial Automation
(For all branches except Electrical Engineering)

Course Code	EEOE-605
Course Title	Industrial Automation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	-
Course Category	OE

Course Outcomes: -

After completion of the course student will be ableto:

1. identify different types of automation systems (K-3 Level).
2. interface I/O devices with the PLC modules (K-4 Level).
3. develop PLC ladder programs for various applications (K-4 Level).
4. prepare simple SCADA applications(K-4 Level).

Course Content:-

Module- 1: Introduction to Industrial Automation

Number of class hours: 04(Four) Hrs

Suggestive Learning Outcomes:

1. To be able to explain significance of automation.
2. To be able to state advantages of automation.
3. To be able to differentiate Relay based & PLC based control system.

Detailed content of the unit: -

Automation: Need and benefits;
Types of automation system: Fixed, Programmable, Flexible;
Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives;
Evolution of PLC.

Module- 2: PLC Fundamentals

Number of class hours: 06(six) Hrs

Suggestive Learning Outcomes:

1. To be able to draw generalized block diagram of PLC.
2. To be able to draw simple block diagrams and functions of different input modules.
3. To be able to know type and use of memory.
4. To be able to compare PC and PLC.
5. To be able to develop block diagram ofPLC power supply.

Detailed content of the unit: -

Building blocks of PLC: CPU, Memory organization, Input- output modules (discrete and analog),
Specialty I/O Modules, Power supply;
Fixed and Modular PLC and their types, Redundancy in PLC module;
I/O module selection criteria; Interfacing different I/O devices with appropriate I/O modules.

Module- 3: PLC Programming basics

Number of class hours: 5(Five) Hrs

Suggestive Learning Outcomes:
1. To be able to name different PLC Programming languages.
2. To be able to understand Ladder diagram development.
3. To be able to develop the PLC ladder programs for the given situation

Detailed content of the unit: -

PLC I/O addressing;
PLC programming Instructions: Relay type instructions, Timer instructions: On delay, off delay, retentive, Counter instructions: Up, Down, High speed, Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions;
PLC programming language: Functional Block Diagram (FBD), Instruction List. Structured text, Sequential Function Chart (SFC), Ladder Programming.
Simple Programming examples using ladder logic: Language based on relay, timer counter, logical, comparison, arithmetic and data handling instructions.

Module- 4: PLC wiring diagrams and Ladder logic

Number of class hours: 08(Eight) Hrs

Suggestive Learning Outcomes:
1. To be able to develop ladder diagrams for the given situations
2. To be able to prepare the relevant wiring diagram for connecting the given type of PLC
3. To be able to describe the method to troubleshoot the given PLC ladder diagram and wiring diagram.

Detailed content of the unit: -

Seal in circuits using PLC.
Ladder and wiring diagram of DOL starter with OLR
Latching relay using PLC
PLC Based Applications: Traffic light control, Elevator control, Tank Level control, Conveyor system.

Module- 5: Supervisory Control and Data Acquisition System (SCADA)

Number of class hours: 8(Eight) Hrs

Suggestive Learning Outcomes:
1. To be able to identify the specific components of the given SCADA system.
2. To be able to prepare block diagram of the given architecture of SCADA.
3. To be able to understand various applications of SCADA.

Detailed content of the unit: -

Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA; Various editors of SCADA;
Interfacing SCADA system with PLC: Typical connection diagram, Object Linking & embedding
for Process Control(OPC) architecture, Steps in Creating SCADA Screen for simple object, Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program using OPC;
Applications of SCADA: Traffic light control, water distribution, pipeline control.

References: -

1. Dunning, G., Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260
2. Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281
3. Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386
4. Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 9780130607188
5. Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN : 9780130618900
6. Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174
7. Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978- 1936007097 Electrical Engineering Curriculum Structure
8. Bailey David ; Wright Edwin, Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053

Principles of Electronic Communication Systems

(For all branches except Electronics and Telecommunication Engineering)

Course Code	ECOE-605
Course Title	Principles of Electronic Communication Systems
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	OE

Course Objectives: **After completing the course, the students will able to**:-

CO 1: Understand the concept of Elements of Electronics Communication System. (K 2)
CO 2: Demonstrate the concept of different types of Amplitude Modulation & Demodulation. (K 2)
CO 3: Illustrate the concept of different types of Frequency Modulation & Demodulation. (K 2)
CO 4: Explain the concept of various types of pulse modulation. (K 2)
CO 5: Understand the basic concepts of Telephony system. (K 2)

Module I - Introduction to Electronic Communication (8 hours)

Learning Outcomes:-

Students will be able to
1) Be familiar with the basic concepts of Electronic Communication.
2) Understand the modulation techniques.
3) Be familiar with the basic requirements for the transmission of signals.

Evolution of Communication System, Elements of Communication systems, Types of electronic communications, Baseband signals and baseband transmission, Modulation techniques, Bandwidth requirements. Introduction to Electronic Communication: Evolution of Communication System, Elements of Communication systems, Types of electronic communications, Baseband signals and baseband transmission, Modulation techniques, Bandwidth requirements.

Module II - Amplitude Modulation & De modulation(8 hours)

Learning Outcomes:-

Students will be able to
1) Understand the concepts of Amplitude Modulation.
2) Explain the operation of different types in Amplitude Modulation.
3) Understand the concepts of Amplitude Demodulation.

Introduction, Equation of AM signal, Modulation index and percentage of modulation for sinusoidal AM, Frequency spectrum of the AM wave, Representation of AM wave, Average power for sinusoidal AM wave, Effective voltage and current for sinusoidal AM, Modulation, Low and high level modulation and their comparison, Low modulator, High level modulator: Basic requirements, modulator circuits: Collector modulator Class C Amplifier, Grid Modulated Class C Amplifier, Pulse

Modulated Class C Amplifier, Amplitude modulated transmitters.
FM receiver, Basics of FM demodulators, Noise triangle in FM, Capture effect, FM stereo system.

Module III - Frequency Modulation &Demodulation (8 hours)

Learning Outcomes:-

Students will be able to
1) Understand the concepts of Frequency Modulation.
2) Explain the operation of different types in Frequency Modulation.
3) Understand the concepts of Frequency Demodulation.

Frequency modulation theory, Characteristic of frequency modulation, Mathematical representation of frequency modulated wave, Frequency emphasis, Directly modulated FM transmitter, Phase−emphasis, De−modulators, Pre modulation, Indirect method of FM modulation, Wide and narrow band FM transmission, Advantages and disadvantages of FM, Comparison of FM and AM system.
FM receiver, Basics of FM demodulators, Noise triangle in FM, Capture effect, FM stereo system.

Module IV- Introduction of Pulse Modulation (8 hours)

Learning Outcomes:-

Students will be able to
1) Understand the basic concepts of Pulse modulation.
2) Explain the operation of different types in Pulse Modulation.

Classification of pulse modulation, Differences between Continuous & discrete time signals, Sampling process, Pulse amplitude modulation, Pulse time modulation, Pulse position modulation, Comparison of PAM and PPM systems, Pulse code modulation, Multiplex transmission, Crosstalk, Comparison of FDM and TDM, Differential pulse code modulation, delta A/D conversion, Comparison−Delta modulation, Adaptive delta modulation, Sigma between PCM, DM, ADM and DPCM.

Module V – Basics of Telephony (8 hours)

Learning Outcomes:-

Students will be able to
1) Understand the basic concepts of Telephony system.
2) Be familiar with the basic system of Electronic Exchange &Teleprinters.

Principles of telephony, Telephone transmitter and receiver, Side tone, Necessity for telephone exchange, Tones in telephony, Automatic exchange, Pulsed and DTMF dialing, Electronic telephone exchanges, E10B Electronic exchange, Teleprinters.

References:
1. Blake, R., Electronic Communication Systems, Thomson Business Information
2. Lathi, B.P., Modern Analog and Digital Communication, Oxford University Press .
3. Hill−Kennedy, G., Electronic Communication Systems, McGraw
4. Hall of India Private Limited−Schweber, W., Electronic Communication Systems, Prentice

Fundamentals of AI

(For all branches except Computer Science & Technology)

Course Code	CSOE605
Course Title	Fundamentals of AI
Number of Credits	4 (L:3, T:1, P:0)
Prerequisites	Basic knowledge of algorithm and searching technique.
Course Category	Open Elective Course

Course Outcomes: -

Upon successful completion of this course, students will be able to

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. **(K1)**
2) Understand and implement search and game algorithms. **(K1, K2)**
3) Explain basic concepts, methods and theories for search. **(K2)**
4) Account for classical planning of proactive agents. **(K1)**
5) Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation, and learning.**(K3)**

Module- 1: Introduction

Number of class hours: 5

After completing this module students will be able to
1) Understand basic concepts and history behind AI. **(K2)**
2) Explain Symbol system. **(K2)**
3) Identify agents of AI. **(K2)**

Detailed content of the unit:

Overview and Historical Perspective of AI, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents of AI.

Module- 2: Searching

Number of class hours: 9

Suggestive Learning Outcomes:
After completing this module students will be able to
4) Understand basic concepts of search mechanism in AI. **(K2)**
5) Explain different types of Heuristic and Randomized Search. **(K2)**
6) Apply search in problem solving. **(K3)**

Detailed content of the unit:

Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.
Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.

Module-3: Path Finding Algorithms

Number of class hours: 8

After completing this module students will be able to
1) Explain different optimal pathfinding techniques. **(K1)**
2) Describe Rule based system. **(K1)**
3) Understand and apply game playing algorithm.**(K2)**

Detailed content of the unit:

Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search.
Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net.
Game Playing**:** Minimax Algorithm, AlphaBeta Algorithm, SSS*.

Module-4: Planning and Constraint Satisfaction

Number of class hours: 7

After completing this module students will be able to
1) Understand and explain forward and backward search. **(K2)**
2) Understand basic concept of planning and propagation.**(K2)**

Detailed content of the unit:

Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graphplan, Constraint Propagation.

Module- 5 :Logic and Inferences
Number of class hours: 6

After completing this module students will be able to
1) Differentiate between various types of Logic. **(K2)**
2) Understand and demonstrate chaining in AI. **(K2)**

Detailed content of the unit:

Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and Backward chaining.

 References: -
1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India)
2. https://nptel.ac.in/courses/106106126/
3. Stefan Edelkamp and Stefan Schroedl. Heuristic Search, Morgan Kaufmann.
4. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and

Prospects of Artificial Intelligence, A K Peters/CRC Press
5. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill.
6. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, Prentice Hall
7. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House.

MANAGEMENT INFORMATION SYSTEM

(For all branches except Information Technology)

Course Code	ITOE605
Course Title	Multimedia Technologies
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	----
Course Category	Open Elective Course

Course Outcomes: -Upon completion of the course the students will be able to:
1) Explain need and importance of Management Information System.
2) Describe the role of MIS in various functional areas of management.
3) Explain the determination of requirement and analysis it to design information system necessary.
4) Elaborate the supporting role of MIS in decision-making.
5) Describe importance of integration of information with MIS and security in MIS.

Course Content:-

Module- 1: Introduction to MIS
No. of Lecture periods:6
Suggestive learning outcomes:
1. Explain information system and its roles.
2. Classify information.
3. Elaborate Management Information System.
4. Describe benefits and limitations of MIS.

Detailed content: Introduction to Information System, need of information system, classification of Information, Key aspects of management, Definition, roles and features of MIS, Structure of MIS, Benefits of MIS, Limitations of MIS.

Module- 2: MIS Development
No. of Lecture periods:10
Suggestive learning outcomes:

1. Describe the roles of system analyst.
2. State the tools used by system analyst in designing information system.
3. Describe MIS development life cycle.
4. State the features of MIS development models.
5. Elaborate MIS design & development phase.

Detailed content: Overview of design of an information system, the role and tasks of systems analysts, tools used by system analyst in designing information system. MIS requirement analysis, MIS requirement specification, feasibility analysis & report, MIS development models, MIS design & development phase.

Module- 3: Decision Support System in MIS
No. of Lecture periods:10
Suggestive learning outcomes:
1. Define decision support system.
2. Describe characteristics and components of DSS.
3. Elaborate decision support models.
4. Explain risks of DSS.

Detailed content: Types of decisions, Define DSS, Characteristics of DSS, Components of DSS, Role of DSS in MIS, Decision Support Models, Risks of DSS in MIS.

Module- 4: Integration of Information.
No. of Lecture periods:7
Suggestive learning outcomes:
1. State the areas of MIS integration with various business function area.
2. Elaborate following terms – ERP, EMS, CRM, BPO, E-commerce.
3. Explain data warehouse and data mining.

Detailed content: Areas of MIS integration with various business function: e.g. ERP & MIS, EMS & MIS, CRM, BPO, E-commerce, Data warehouse & data mining.

Module- 5: MIS Security.
No. of Lecture periods:7
Suggestive learning outcomes:
1. Define MIS security.
2. Elaborate threats & vulnerability, assessing risks in MIS security.
3. Describe in brief the importance of common MIS controls (physical, electronic, software, management controls).
4. Predict the damage by MIS threats (natural disasters, employee errors, computer crime, frauds, abuse, program bugs).
5. Elaborate control, audit and security of MIS.

6. Describe the Access controls, QA and QC in context of Information Security and control.

Detailed content: MIS security risks, threats & vulnerability, assessing risks, Common MIS controls (Physical, Electronic, Software, Management controls), MIS threats (natural disasters, employee errors, computer crime, fraud, abuse, program bugs), information security and control concepts – Access controls, QA and QC concepts with respect to the processes of various functional areas of management, social and security issues related to MIS, Control, audit and security of MIS.

List of books:

1. Management Information System, Davis, Tata McGraw-Hill.
2. Designing Management Information Systems, Hans van der Heijden, Govardus, Maria Heijden, Oxform University Press.
3. Management Information Systems : An Insight, Hitesh Gupta, Internation Book House.
4. Management Information Systems, S. Sadagopan, PHI Learning PVT. Ltd.

OPERATIONS RESEARCH

(For all branches except Mechanical Engineering)

Course Code	MEOE 611/ B
Course Title	Operations Research
Number of Credits	4(L: 3, T: 1, P: 0)
Prerequisites	Nil
Course Category	Open elective course

Course Outcomes: - **By the end of the course, the students are expected to**

CO1: Recognize the importance and value of Operations Research and mathematical modelling in
solving practical problems in industry. (K5)
CO2: Formulate a managerial decision problem into a mathematical model. (K5)
CO3: Understand Operations Research models and apply them to real-life problems. (K2)
CO4: Understand and implement the Transportation Models and Assignment Models at workplace. (K2)
CO5: Understand the characteristics of different types of decisions. (K2)

Course Content:-

Module- 1: Development of Operations research

Number of class hours: 8 Hrs.

Suggestive Learning Outcomes:

4) Understand Definition, Characteristics and phase of Scientific Method.
5) Describe the location of power plant.

Detailed content of the unit: -

Development of Operations research: Definition, Characteristics and phase of Scientific Method, Types of models; General methods for solving operations research models.

Module-2: Allocation

Number of class hours: 8 Hrs.

Suggestive Learning Outcomes:

4) Formulate linear programming models.
5) Solve linear programming problem by using different methods.

Detailed content of the unit: -
Allocation: Introduction to linear programming formulation, graphical solution, Simplex Method, artificial variable technique, Duality principle. Sensitivity analysis.

Module- 3: Transportation Problem
Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

4) Formulate and solve Transportation problems.
5) Formulate and solve Assignment problems.

Detailed content of the unit: -

Transportation Problem: Formulation; Optimal solution; Unbalanced Transportation problems; Degeneracy; Assignment problem: Formulation; Optimal solution.

Module 4- : Sequencing

Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

4) Understand Sequencing problems.
5) Formulate and solve different types of Sequencing problems.

Detailed content of the unit: -

Sequencing: Introduction; Terminology; Notations and Assumptions; Problems with n-jobs and two machines; Optimal sequence algorithm; Problems with n-jobs and three machines.

Module- 5: Theory of games
Number of class hours: 8 Hrs

Suggestive Learning Outcomes:

4) Discuss the Two-person zero-sum games.
5) Describe the Maximum–Minimax principle.
6) Solve Game Theory problems by different methods.

Detailed content of the unit: -

Theory of games: Introduction; Two-person zero-sum games; The Maximum–Minimax principle; Games without saddle points; Mixed Strategies; 2 x n and m x 2 Games; Graphical solutions; Dominance property; Use of L.P. to games.

Reference Books:
1. Operations Research: Principles and Applications -G.Srinivasan, PHI Learning Private Limited.
2. Operations Research: An Introduction - Hamdy A. Taha, Pearson.

3. Operations Research: Principles and Practice - Ravindran, Phillips and Solberg, Wiley India
4. Operations Research: Concepts and Cases - Hillier and Liberman, McGraw-Hill 1984.
5. Operations Research: Gupta & Hira, S. Chand.

AUTOMOBILE CHASSIS

(For all branches except Automobile Engineering)

Course Code	AEOE611/B
Course Title	Automobile Chassis
Number of Credits	04 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	Open elective-2

Course outcomes:

After completing this course, student will be able to:

1) Describe the components of automobile chassis and the different types of chassis layout.

2) Express about Aerodynamic consideration in body profiling and different types of front axle arrangements.

3) Explain steering geometry and features of given type of steering.

4) Understand about Power steering system and its working principle, types of power steering system.

5) Discuss necessity of power brakes, construction and working principle of power brakes.

6) Explain functions of suspension systems, air and hydro pneumatic suspension.

Course Contents:

Module - I: Basics of Automobile Chassis

Number of class hours:

Suggestive Learning Outcomes:
1. Explain the different components of automobile chassis.
 2. Differentiate the various types of automobile chassis.

Detailed content of the unit:

History and Developments of Automobiles; Classification of Vehicles; Components of Automobile Chassis; Layout of Conventional Type Chassis--Front Engine Front Wheel Drive, Rear Engine Rear Wheel Drive, Four Wheel Drive; Comparison between various types

of Chassis Layout; Mono Coquet Chassis. Automobile Frame; Types of Frame; Alignment of frames; Two wheeler frames; Stresses on frames; Defects in frames.

Module - II: Automobile Body and axles

Number of class hours:

Suggestive Learning Outcomes:
1. Understand the vehicle body architecture.
2. Describe the front axle arrangement.

Detailed content of the unit:

Automobile Body Construction; Vehicle Body Architecture; Aerodynamic consideration in body profiling; Comparison between Integral body and Framed Construction.
Live Axles; Dead Axles; Types of Front Axle Arrangement; Front Wheel Assembly; Trans-axle. Types of stub axle arrangements- Elliot, Reverse Elliot, Lamoine and Reverse Lamoine, Front wheel assembly.

Module - III: Steering System

Number of class hours:

Suggestive Learning Outcomes:
1. Discuss the steering geometry.
2. Describe the salient features of the given type of steering.

Detailed content of the unit:

Steering Geometry; Camber; Castor; King Pin Inclination or Steering Axis Inclination; Combined Angle; Centre Point Steering; Toe-in &Toe-out; Correct Steering Angle; Steering Gears – worm and sector, Rack and pinion, ball Re-circulating type; Steering Linkage – Components and functions; Factors affecting Steering; Under-steering; Over-steering; Steering System – Troubleshooting. Independent suspension system. Ackerman steering gear mechanism. Construction, working and application of Steering gear box.
Principles of Power Steering; Comparison between Conventional Steering System and Power Steering System; Power Steering System Types; Construction and working of different power steering system; Power Steering Pumps; Four Wheel Steering; Power Steering System – Troubleshooting.

Module - IV: Braking System

Number of class hours:

Suggestive Learning Outcomes:
1. Explain the braking principle and different types of brake.
2. Describe with sketches construction and working of pneumatic and disc brakes.
3. Explain types of power brakes, construction and working principle of power brakes.

Detailed content of the unit:

Principle of Braking. Braking effect- weight transfer. Types of Brakes. Drum Brakes Construction and working Leading Shoe, Trailing shoe. Mechanical Brakes. Hydraulic Brakes- Bleeding of Brakes. Master cylinder, wheel cylinder. Properties of Brake Fluid. Pneumatic Brake- construction and working. Brake drum- their material, lining thickness, brake clearance. Heat generation and operating temperature antifade characteristics. Disc brakes- operation and construction. Solid and ventilated disk brakes. Comparison between Drum Brake and Disc Brakes. Hand Brake, Exhaust Brake, Fail Safe Brakes. Adjustments of Brakes. Brake Test. Brake System Troubleshooting.
Necessity of Power Brakes. Types of Power Brakes. Construction and working principle of power brakes (Pedal assisted and combined unit type). Vacuum pump, manifold vacuum Antilock Brake System. Power Brake Troubleshooting.

Module - V: Suspension Systems

Number of class hours:

Suggestive Learning Outcomes:
1. Explain functions of suspension system.
2. Classify tyre suspension systems.
3. Explain air and hydro pneumatic suspension.

Detailed content of the unit:

Functions of suspension system. Sprung weight, Un-sprung Weight. Types of suspension system (Rigid axle suspension system, Independent suspension system). Springs (Leaf spring, Coil spring). Helper springs (Variable rate springs). Air and Hydro Pneumatic Suspension.

References: -

1) Heldt.P.M. Automotive Chassis, Chilton Co., New York, 1990. 2. Steed.W., Mechanics of Road Vehicles, IIIiffe Books Ltd., London, 1.
2) Powloski. J. Vehicle Body Engineering, Business Books Ltd., 1989.

ENERGY EFFICIENT ARCHITECTURE

(For all branches except Architectural Assistantship)

Course code	AROE 605
Course title	Energy efficient architecture
Number of Credits	3(L:3,T:0,P:2)
Prerequisites	Nil
Course Category	Open Elective

Expected Course outcome: By the end of the course, the students are expected

CO-1: To understand the passive design consideration(K2)
CO-2: To explain the building materials and its impact on environment(K2)
CO-3: To use various Energy Efficient Materials and Sustainable   Construction
       Technology.(K3)

Module 1

Number of class hours: 12

Suggestive Learning Outcomes

1) Student will be able to describe the significance of energy efficiency(K2)
2) Student will be able to explain the thermal performance of building components (K2)

Detailed content of the unit:

1.1 Significance of Energy Efficiency in the contemporary context, Simple passive design
      Considerations involving Site Conditions,

1.2 Building Orientation, Plan form and Building Envelope – Heat transfer and Thermal
      Performance of Walls and Roofs

Module 2

Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to describe the process of heat gain(K2)
2) Student will be able to discuss different types of natural ventilations(K2)

Detailed content of the unit:

2.1 Direct Gain Thermal Storage of Wall and Roof - Roof Radiation Trap - Solarium - Isolated Gain

2.2 Evaporative Cooling - Nocturnal Radiation cooling - Passive Desiccant Cooling – Types of 2.3 Ventilation - Ventilation and Building Design. Induced Ventilation - Earth Sheltering - Wind Tower - Earth Air Tunnels

Module 3
Number of class hours: 10

Suggestive Learning Outcomes
1) Student will be able to demonstrate areas of innovation in improving energy efficient building(K3)
2) Student will be able to identify of various simulating software (K2)

Detailed content of the unit:

3.1 Areas for innovation in improving energy efficiency such as Photo Voltaic Cells, Battery Technology, Thermal Energy Storage, Recycled and Reusable Building materials,

3.2 Nanotechnology, smart materials and the future of built environment, Energy Conservation Building code

3.3Introduction to simulation software for carrying out thermal design of buildings and   predicting performance, materials and construction techniques for achieving energy efficiency

Module 4

Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to indicate   the sustainable development(K2)
2) Student can discuss about portable architecture (K2)

Detailed content of the unit:

4.1 Design issues relating to sustainable development including site and ecology, community and culture, health, materials, energy, and water-

4.2 Domestic and Community buildings using self-help techniques of construction; adaptation, repair and management. portable architecture

Module 5
Number of class hours: 10

Suggestive Learning Outcomes

1) Student will be able to discuss the traditional building construction techniques(K2)

2) Student will be able to identify the intelligent building (K2)

Detailed content of the unit:

5.1 Energy Efficient Construction Technology – Filler Slab – Rat trap Bond – Technologies
developed by CBRI Traditional Building Construction Technologies

5.2 Introduction to other Technological interventions to save Energy – Intelligent Buildings

 5.3 Energy Conservation through Technological intervention Saving Energy used for lighting   by design innovation – Case studies.

R E F E R E N C E   B O O K S

1.	Manual on Solar Passive Architecture, IIT Mumbai and Mines New Delhi, 1999
2.	 Arvind Krishnan & Others, "Climate Responsive Architecture", A Design Handbook for
3.	Energy Efficient Buildings, TATA McGraw Hill Publishing Company Limited, New Delhi, 2001
4.	 Majumdar M, "Energy-efficient Building in India", TERI Press, 2000.
5.	Givoni .B, "Passive and Low Energy Cooling of Buildings", Van Nostrand Reinhold, New York, 1994
6.	Fuller Moore, "Environmental Control Systems", McGraw Hill INC, New Delhi - 1993
7.	 Sophia and Stefan Behling, Sol power, "The Evolution of Solar Architecture", Prestel, New York, 1996
8.	Patrick Waterfield, "The Energy Efficient Home: A Complete Guide", Crowood press ltd, 2011.
9.	Dean Hawkes, "Energy Efficient Buildings: Architecture, Engineering and Environment",
10.	"Green from the Ground Up: Sustainable, Healthy and Energy efficient home construction", Taunton Press, 2008
11.	Manual of Tropical housing and Building by Koenigsberger Ingersoll et al. Longman Group Ltd. London now published by Orient Longman Ltd., Madras, India.
12.	Design with climate: bioclimatic approach to architectural regionalism by Olgyay, V., Princeton University Press.
13.	Climate responsive architecture: a design handbook for energy efficient buildings by Krishan, A., Tata McGraw-Hill Education.
14.	Bureau of Energy Efficiency, "Energy Conservation Building Code 2017", Ministry of Power, Govt. of India.

Food Chemistry and Nutrients

(For all branches except Food Processing Technology)

Course Code	FPOE604
Course Title	Food Chemistry and Nutrients
Number of Credits	04
Prerequisites	Basic chemistry
Course Category	Open Elective-2

Course Outcomes: -

1. Understand the fundamentals of nutrition. (K2)
2. Describe the carbohydrates.(K2)
3. Illustrate the details of proteins and lipids. (K3)
4. Discuss aboutwater and micronutrients. (K2)
5. Explain metabolism and energy balance. (K2).

Module- 1:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to define nutrition.
2. Students will be able to classify nutrients.

Detailed content of the unit :

An Overview of Nutrition
Definition, classes of nutrients, calculating energy values from food, using the RDA, nutritional status, nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations; Balanced diet planning: Diet planning principles, dietary guidelines, food groups, exchange lists, personal diet analysis; Digestion, Absorption: digestion, absorption of nutrients.

Module- 2:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to know the types of carbohydrates.
2. Students will be able to discuss the properties of carbohydrates.

Detailed content of the unit :

Carbohydrates

Simple Sugars: mono and disaccharides, Properties, Caramelization, Maillard reaction;Sugar alcohols; Oligosaccharides: structure, nomenclature, occurrence, uses in foods. Polysaccharides: Starch-Structure, Properties, Functional role in food system, Modified starches, Resistant starch, Starch hydrolysates, Applications in food industry. Non starch polysaccharides:Pectins, Gums &Hydrocolloid, Fiber - Cellulose & hemicellulose; Food sources, functional role and uses in foods.Digestion and absorption of carbohydrates, lactose intolerance; Glycemic and Nonglycemic carbohydrates, health effects of fiber and starch intake, Artificial sweeteners.

Module- 3:

Number of class hours: 15

Suggestive Learning Outcomes:

1. Students will know about details of proteins.
2. Students will be able to discuss the properties of fats.

Detailed content of the unit :

Proteins& Lipids

protein structure, Properties & reactions of proteins in food systems: Dissociation, optical activity, solubility, hydration, swelling, foam formation & stabilization, gel formation, emulsifying effect, thickening & binding, amino acids in Maillard reaction, denaturation; Food enzymes, Food sources, functional role and uses in foods. structure, composition & nomenclature of fats. Nonglyceride components in fats & oils;

Properties of fats & oils: crystal formation, polymorphism, melting points, plasticity, unsaturation; Modification of fats: hydrogenation, interesterification, acetylation, winterization; Hydrolytic rancidity & oxidative rancidity; radiolysis, Shortening power of fats, tenderization, emulsification, smoke point, auto oxidation, polymerization; Food sources, functional role and uses in foods.

Module- 4:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will know the role of water.
2. Students will be able to illustrate the details of minerals.

Detailed content of the unit :

Water and Micronutrients

Chemistry, physical properties, water, water activity. water hardness, water quality for food processing.Mineral & vitamin content of foods- Food and Pharmaceutical grades; Recommended

daily intake,toxicities, deficiencies, factors affecting bioavailability, Stability under food processing conditions.

Module- 5:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will know about metabolism.
2. Students will be able to discuss energy balance.

Detailed content of the unit :

Metabolism and Energy balance

Catabolic and anabolic pathways of glucose, fats and amino acids; Definition, units, calorific value of foods – bomb calorimeter; energy requirements – basal metabolism, specific dynamic action of foods, energy balance, direct and indirect calorimetry, physiological energy value of foods; Energy Balance health implications, obesity, Weight Control: Fat cell development, dangers of weight loss, identify unsafe weight loss schemes, treatment of obesity; attitudes and behaviours toward weight control.

References:

1. Chopra, H.K. and P.S. Panesar. " Food Chemistry". Narosa, 2010.
2. Meyer, Lillian Hoagland. "Food Chemistry". CBS Publishers, 1987.
3. Gibney, Michael J., et al., "Introduction to Human Nutrition". 2nd Edition. Blackwell,2009.
4. Gropper, Sareen S. and Jack L.Smith "Advanced Nutrition and Human Metabolism". 5th Edition. Wadsworth Publishing, 2008.

Green Biotechnology

(For all branches except Medical Laboratory Technology)

Course Code	MLOE604
Course Title	Green Biotechnology
Number of Credits	4
Prerequisites	Nil
Course Category	Open elective-2

Course Outcomes: -

1. Students will be able to understand various concepts & principles of Green Biotechnology.
2. Students will be able to enumerate the background of Green Biotechnology and its significance.
3. Students will be able to evaluate problems on Green Biotechnology and its applications.

Course Content:-

Module- 1: E-waste management and Green biotechnology

Number of class hours: 04hrs

Suggestive Learning Outcomes:

1. Students will be able to understand basics of background and principles of E-waste management and Green biotechnology.
2. Students will be able to analyse significance of E-waste management and Green biotechnology.
3. Students will be able to enumerate various methods in E-waste management and Green biotechnology.

Detailed content of the unit: -

Basics of E-waste, E-wastes leading to water and soil pollution , ISO 14000 & Environmental Management , Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste. Steps in E-waste management and biotechnology based solutions.

Module- 2: Machine Learning for Green Biotechnology

Number of class hours: 08hrs

Suggestive Learning Outcomes:

1. Students will be able to enumerate various methods in Machine Learning for Green Biotechnology.

2. Students will be able to understand basics of background and principles of Machine Learning for Green Biotechnology.
3. Students will be able to analyse significance of Machine Learning for Green Biotechnology.

Detailed content of the unit: -

Bayesian concepts in protein structure prediction, Support Vector Machine (SVM) based technologies for identification of novel mutations in a bacteria or virus , Decision trees and implementation of high level assembly in biological macro-molecule , ANN based method for domain architecture in enzymes with environmental applications. Analysis and profiling of biomolecules of medical application using Machine learning principles, Bio-inspired algorithms for prediction of molecular function, Networking in molecular level , Molecular graphics and application of image processing in Biotechnology,

Module- 3: Big Data analytics and Green Biotechnology

Number of class hours: 08hrs

Suggestive Learning Outcomes:

1. Students will be able to enumerate various methods in Big Data analytics and Green Biotechnology.
2. Students will be able to understand basics of background and principles of Big Data analytics and Green Biotechnology.
3. Students will be able to analyse significance of Big Data analytics and Green Biotechnology.

Detailed content of the unit: -

Concept of grid computer and GUI , Classifications and clustering of Biological data , Handling of large volume of biomedical data , File formats and databases relevant to biotechnology, Implementation of feature selection & classification in biotechnology applications , Pattern recognition in high throughput biomedical data , Bootstrapping and analysis of biomedical data for different applications , Cloud platform and its implementation of biotechnology, Python based tools for visualizing biomedical data for biotechnology applications. Regression analysis, Scatter plot, histogram, hypothesis testing, significance of p-value, chi-square, T-test, ANOVA and Bayesian Probability for biomedical and biotechnology applications.

Module- 4: Biofuels

Number of class hours: 08hrs

Suggestive Learning Outcomes:

1. Students will be able to enumerate various methods related to Biofuels.

2. Students will be able to understand basics of background and principles of Biofuels.
3. Students will be able to analyse significance of Biofuels.

Detailed content of the unit:

Chemistry of biofuels , Rational of using alcohol and fossil fuel as hybrid fuels , Nature of Biodiesels , Production method of Biodiesels , Technical bottlenecks of using biodiesels , Genetically engineered organisms for enhanced production of biodiesels , Harvesting of biomass for biodiesel production, Centrifugation , Precipitation and flocculation for harvesting of biomass.

Module- 5: Civil and Environmental Managements through Green Biotechnology

Number of class hours: 08hrs

Suggestive Learning Outcomes:

1. Students will be able to enumerate various methods used in Civil and Environmental Managements through Green Biotechnology.
2. Students will be able to understand basics of background and principles of Civil and Environmental Managements through Green Biotechnology.
3. Students will be able to analyse significance of Civil and Environmental Managements through Green Biotechnology.

Detailed content of the unit:

Biological wastewater treatment, Analysis of municipal sewage , Principles and design aspects of various waste treatment methods with advanced bioreactor configuration , Introduction and types of bioremediation, bioremediation of surface soil and sludge, In situ and Ex-situ technologies, phytoremediation, reforestation through micro propagation, use of mycorrhizae in reforestation, use of microbes for improving soil fertility, restoration of soils contaminated with heavy metals ,Analysis of BOD , COD and abiotic stress of water body.

Module- 6: Biotechnology for allied industries

Number of class hours: 08hrs

Suggestive Learning Outcomes:

1. Students will be able to understand basics of background and principles of Biotechnology for allied industries.
2. Students will be able to enumerate various methods used in Biotechnology for allied industries.
3. Students will be able to analyse significance of Biotechnology for allied industries

Detailed content of the unit:

Wearable technologies for sustainable approaches, biogenic synthesis of nano materials for varied applications, Interaction of small molecules in a matrix/ textiles and their bioactivity , Bioelectrical signals of cardiac origin and monitoring through pacemakers, Photo analytic methods for estimation of dyes and pigments , ADMET analysis of dyes and pigments , HACCP analysis for nutaceuticals and food materials , Concept of functional food , Other green technologies.

Sample Tutorial:

1. Analysis of the Interaction of small molecules in a textiles and their bioactivity.
2. Regression analysis and generation of scatter plot, histogram, and evaluation of data by chi-square, T-test and ANOVA.
3. Cloud platform and its implementation in biotechnology through a Python script.
4. Hazard analysis of E-wastes in an institute.

References:

1. Environmental Biotechnology, B.C. Bhattacharya &Ritu Banerjee, Oxford Press, 2007.
2. Bioinformatics: methods and applications, S. C. Rastogi, PHI learning; 4th edition, 2013.
3. Biotechnology for Waste mass Utilization, Sarangi et al , Eds , CRC Press, Taylor & Francis, UK , 2022 , ISBN:978-1-77463-995-5.
4. Environmental Biotech, PradiptaKrimar, I.K. International Pvt. Ltd., 2006.
5. Environmental Microbiology & Biotechnology, D.P. Singh, S.K. Dwivedi, New Age International Publishers, 2004.
6. The Role of Microalgae in Wastewater Treatment,Suklaet al , *Eds*., Springer Nature Singapore Pte Ltd. 2019, ISBN:978-981-13-1585-5.
7. Basic Biotechnology,R.C.Dubey , S.Chand Publisher ,Recent Edition.

Garment Design

(For all branches except Fashion Technology)

Course Code	FTOE-605
Course Title	Garment Design
Number of Credits	4(L: 4, T: 0, P: 0)
Prerequisites	
Course Category	Open elective course-2

Course Outcomes: -1) To learn about importance of design sources

2) Idea about use of medium of decoration on dresses.

3) Knowledge on Measurement & its importance

4) Gaining idea about basic garment construction techniques

5) Gaining idea about fullness & design

Course Content:-

Module- 1: Design Sources

Number of class hours: 3Hours
Suggestive Learning Outcomes:

1) Knowledge on port folio management

2) Idea about different embroidery, painting, texture, patches, colours, etc.

Selectionofdesign,whatisadesign?Howtodesign?PresentationtechniquesFlatsketches,portfolio-ConceptandmeaningofPort-folio management.
Useofmediumofdecorationondressessuchasembroidery,painting,texture,patches,colours,etc.

Module- 2: Measurement & Layout

Number of class hours: 3hours

Suggestive Learning Outcomes: 1) Knowledge on Measurement & its importance
2) Idea about layout

Measurement & its importance - standard body measurement for children, ladies and
gents.Sequenceoftakingbodymeasurementforvariousagegroupandsex.Recordingof measurement.
Layout–openlayout,lengthwiselayout,crosswiselayout,doublelayout,etc.Principles of layout-laying of different patterns on different types of fabrics.

Module-3: Garment Construction
Number of class hours: 4hours

Suggestive Learning Outcomes: 1) Learning about different garment stitches

2) Knowledge on fashion value addition

Study of stitches classification – introduction to sewing machine and its parts common problems and its remedies. Stitches –constructing stitches –temporary andpermanentstitches.Seams–definition,typesandseamfinishes,theirsuitabilityandappl icationinvariousgarments.

Module-4: Fullness
Number of class hours: 3hours

Suggestive Learning Outcomes: 1) Gaining idea about fullness
2) Knowledge on garment controlling parameters.
Fullness – definition, methods of introducing fullness in garments, gathers, pleats, flares, tucks & darts, methods of controllinggfullness.

Module- 5: Designing
Number of class hours: 2hours

Suggestive Learning Outcomes: 1) To gain idea about designing collars
2) Knowledge on fashion forecasting.

Factorstobeconsideredindesigningcollars.
Futureofchildren,ladiesandgentsgarments-
Growthofapparelindustryforchildren,ladiesandgents-Roleoffashion-
colour,fabric,textureofladies,childrenandgentsgarments.

References: -
1. Dressdesign,drapingandflatpatternbyHillhouseandMansfield.
2. DresspatternDesigningbyNatalieBray.
3. DraperyoffashiondesignbyFildeJeffe,NorieRelas.
4. DrapingbyRestonPublishingCo.Virgina.

ECONOMIC POLICIES IN INDIA

(Common for all branches)

Course Code	HSOE-605/A
Course Title	Economic Policies in India
Number of Credits	4(L: 4, T: 0, P: 0)
Prerequisites	
Course Category	Open elective course-2

Course outcomes:

At the end of the course, the student will be able to:

CO1	Describe the Basic Structure and Concepts of Indian Economy.
CO2	Understand the various Phenomenon affecting the Indian Economic System.
CO3	Interpret the Role of Industry and Agriculture in Economic Development.
CO4	Categorize the Contribution of Money Market and Capital Market in the Economy.
CO5	Demonstrate the Need of Economic Planning and Economic Policies in the Economic System.

Module 1: Structure of Indian Economy.

Intended Learning Outcomes:

(a) Describe the Characteristics of Indian Economy
(b) Exhibit Knowledge of Basic Economic Concepts

Content:

- Characteristics of an underdeveloped economy.
- Features to show India as a developing economy.
- Concept of National Income and concepts of GDP, GNP, NDP, NNP, Depreciation, Per Capita Income, Transfer Payments etc.
- Infrastructure - Social and Economic.

Module 2: Poverty, Unemployment, Inflation, Population.

Intended Learning Outcomes:
(a) Identify various Elements of Economic Problem in India
(b) Indicate the Impact of Population on Economic System

Content:

- Poverty (Definition, Causes of poverty).
- Unemployment (Different types of unemployment, Measures to reduce unemployment.).
- Causes of Price rise, Measures to control price rise.
- Howgrowth of population helps and retards economic development.

Module 3: Industry and Agriculture.

Intended Learning Outcomes:

(a) Understand the Role of Agriculture and Various Industrial Entities in Indian EconomicSystem
(b) Recognize the Need of SEZs for Economic Development

Content:

- Role of agriculture in Indian economy, Causes of low productivity of agriculture, Green Revolution.
- Role Small Scale and large Scale Industries.
- Concepts of Liberalisation, Privatisation and Globalisation.
- Role of Public Sector in Indian economy.
- Concept of Special Economic Zone (SEZ).

Module 4: Money market and Capital market.

Intended Learning Outcomes:

(a) Explain Role and Characteristics of Money Market and Capital Market
(b) Interpret the Weakness of Capital Market in India

Content:

- Functions of commercial banks
- Bank nationalization and its effects
- Functions of Reserve Bank of India.
- Functions of Capital Markets
- Weakness of Capital Market in India.
- SEBI – its role.

Module 5: Planning, NITI Ayog, and Public Finance

Intended Learning Outcomes:

(a) Describe the Achievements and Failures of Economic Planning
(b) Demonstrate Knowledge of Economic Institutions and Various Economic Policies

Content:

- ➢ Objectives of Planning
- ➢ Achievements and Failures of Planning.
- ➢ NITI   Ayog – its role.
- ➢ Concepts of Public Finance and Budget.
- ➢ Concept of GST.

Reference Books

1. Indian Economic Development for Class 12 :   Sandeep Garg.
       PUB: Dhanpat Rai Publishing Co. Pvt. Ltd.

2. Indian Economy: Dutt&Sundharam.
       PUB: S. Chand Publishing House.

3. Indian Economy: Misra&Puri.
       PUB: Himalaya Publishing House.

4. The Indian Economy: Sanjeev Verma.
       PUB: Mittal Books India.

5. Indian Economy: (Principles, Policies and Progress. 2nd. Ed). Sriram Srirangam, Manish kumar
      and Rohit Deo Jha.
       PUB: Pearson.

CLASSICAL TEXT READING

Course Code	:	HSOE-605/B
Course Title	:	Classical Text Reading
Number of Credits	:	3 (L: 3, T: 0, P:0)
Prerequisites	:	NIL
Course Category	:	OE

Course outcomes:

After competing this course, student will be able to:

- CO.1 Infer from the ancient scripture 'Abhijnana Shakuntalam'(K2)
- CO.2 Discoverthe earliest literature on music and drama- Natyashastra(K3)
- CO.3 Generalize the event of 'the dicing'(K2)
- CO.4   Identify the events of The Ramayana(K2)
- CO.5   Summarize the fact of The Mahabharata(K2)

Detailed Course Content

Module – I: Kalidasa, Abhijnana Shakuntalam

Number of Class hours: 08

Learning Outcomes:

1. Outline the significance of the title Abhijnana(Recognition) Shakuntalam(K1)
2. Identify the dramatic function of the ring in Abhijnana Shakuntalam(K2)

Detailed content of the unit:

Kalidasa Abhijnana Shakuntalam, tr. Chandra Ranjan, in Kalidasa: The Loom of Time

(New Delhi: Penguin, 1989).

Module– II: Bharata, Natyashastra

Number of Class hours: 08

Learning Outcomes:

1. Recognize that Natyashastra's focus was on dance and drama, with music as an aid(K2)
2. Demonstrate the concept of Natyashastra(K3)

Detailed content of the unit:

Bharata, Natyashastra, tr. Manomohan Ghosh, vol. I, 2ndedn(Calcutta: Granthalaya, 1967) chap. 6: 'Sentiments', pp. 100-18.

Module- III: Vyasa, 'the Dicing' and 'the sequel to dicing'

Number of Class hours: 08

Learning Outcomes:

1. Discuss the facts of 'the Dicing' and 'the sequel to Dicing'(K2)

Detailed content of the unit:

Vyasa 'the Dicing' and 'the sequel to dicing'. 'The Book of the Assembly Hall'.

' The Temptation of Karma', Book V 'The Book of Effort', in The Mahabharata: tr. And ed. J.A.B. van Buitenen(Chicago: Brill, 1975) pp. 106-69

Module- IV: Valmiki, The Ramayana

Number of Class hours: 08

Learning Outcomes:

1. Summarize the facts of The Ramayana(K2)

Detailed content of the unit:

The Ramayana: Translated IntoEnglish Prose from the Original Sanskrit; Aranya Kandam (Classic Reprint)

Module- V: The Mahabharta of Vyasa

Number of Class hours: 08

Learning Outcomes:

Summarize the facts and events of The Mahabharata of Vyasa (K2)

Detailed content of the unit:

The Mahabharata of Vyasa- English prose translation by Kisari Mohan Ganguli, translated directly from the Sanskrit Source (1883-1896)

References

1. Bharata, Natyashastra, tr. Manomohan Ghosh, vol. I, 2nd edn (Calcutta: Granthalaya, 1967) chap. 6: Sentiments', pp. 100-18.

2. Iravati Karve, 'Draupadi', in Yuganta: The End of an Epoch (Hyderabad: Disha, 1991) pp. 79-105.

3. J.A.B. Van Buitenen, 'Dharma and Moksa', in Roy W. Perrett, ed., Indian Philosophy, vol. V, Theory of Value: A Collection of Readings (New York: Garland, 2000) pp. 33-40.

4. Vinay Dharwadkar, 'Orientalism and the Study of Indian Literature', in Orientalism and the Postcolonial Predicament: Perspectives on South Asia, ed. Carol A. Breckenridge and Peter van der Veer (New Delhi: OUP, 1994) pp. 158-95.