SWAMI DAYANANDA

COLLEGE OF ARTS & SCIENCE

Affiliated to Bharathidasan University, Tiruchirappalli.
Accredited by NAAC - 'B++' Grade (With CGPA 2.99) (I Cycle)
UGC Recognized u/s 2(f) & 12 (B)
Dayananda Campus, Manjakkudi – 612 610. Tamilnadu, India.

HAND BOOK

DEPARTMENT OF
COMPUTER SCIENCE – BSc AI&ML

INDEX

Profile of BSc

Artificial Intelligence
& Machine Learning

With the technological advancement and rapid growth in MNCs and IT, the need for computer professionals is growing day-by-day. Hence, BSc AI&ML is an excellent career choice for those who have always been fascinated by the world of the computer.

Bachelor of Computer Applications is a three-year undergraduate course which deals with information technology and computer applications. The course imparts knowledge about different computer applications and how to solve and address the problems which arise from a computer and its applications. The course includes subjects such as core programming languages Java and C, data structure, Artificial Intelligence, Machine Learning, IOT and others. BSc AI&ML provides various opportunities to the students who wish to pursue their career in IT and software

Career Options and Job Prospects

- Since the course is specifically aimed at computers and its uses, there are numerous career opportunities that one can take up after completing their graduation.
- Students can pursue higher studies such as M.Sc, MCA, MBA, M.C.M. to enhance their knowledge and get better job opportunities.
- The programme is designed in such a way that it makes students job ready for the career in IT & Software Industry.

BSc AI&ML: Jobs

Data Scientist

BigData Engineer

Business Intelligence Developer

Machine Learning Engineer

Robotics Scientist

Natural Language Processing Engineer

Automation Engineer

Business Forecast Manager

Simulation Manager

Simulation Designer

BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI-620 024.

B.Sc. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2022-23 onwards)

Sem.	Part	Course	Title	Ins. Hrs	Credit	Exam Hours	Marks		Total
							Int.	Ext.	
I	I	Language Course – I Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course - I		6	3	3	25	75	100
	III	Core Course – I (CC)	Programming in C and Data Structures	5	4	3	25	75	100
		Core Practical – I (CP)	Programming in C Lab	4	4	3	40	60	100
		First Allied Course – I (AC)		4	4	3	25	75	100
		First Allied Course – II (AC)		3	-	-	-	-	-
	IV	Value Education		2	2	3	25	75	100
	TOTAL			**30**	**20**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course- II		6	3	3	25	75	100
	III	Core Course – II (CC)	Programming in Python	5	4	3	25	75	100
		Core Practical – II (CP)	Programming in Python Lab	4	4	3	40	60	100
		First Allied Course – II (AC)		3	2	3	25	75	100
		First Allied Course – III (AC)		4	4	3	25	75	100
		Add on Course – I ##	Professional English – I	6*	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Language Proficiency for Employability -Effective English	-	2	3	25	75	100
	TOTAL			**30**	**28**	**-**	**-**	**-**	**900**

III	I	Language Course – III Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course -III		6	3	3	25	75	100
	III	Core Course – III (CC)	RDBMS and NoSQL	5	4	3	25	75	100
		Core Practical – III (CP)	RDBMS and NoSQL Lab	4	4	3	40	60	100
		Second Allied Course – I (AC)		4	4	3	25	75	100
		Second Allied Practical (AP)		3	-	-	-	-	-
		Add on Course – II ##	Professional English - II	6*	4	3	25	75	100
	IV	Non-Major Elective I @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10th & 12th std.		2	2	3	25	75	100
	TOTAL			**30**	**24**	**-**	**-**	**-**	**700**
IV	I	Language Course –IV Tamil $ / Other Languages + #		6	3	3	25	75	100
	II	English Course – IV		6	3	3	25	75	100
	III	Core Course -IV (CC)	Artificial Intelligence	5	4	3	25	75	100
		Core Practical - IV (CP)	Artificial Intelligence Lab	4	4	3	40	60	100
		Second Allied Practical (AP)		3	2	3	40	60	100
		Second Allied Course – II (AC)		4	4	3	25	75	100
	IV	Non-Major Elective II @ - Those who choose Tamil in Part I can choose a non-major elective course offered by other departments. Those who do not choose Tamil in Part I must choose either a) Basic Tamil if Tamil language was not studied in school level **or** b) Special Tamil if Tamil language was studied upto 10th & 12th std.		2	2	3	25	75	100
	VI	Naan Mudhalvan Scheme (NMS) @@	Digital Skills for Employability	-	2	3	25	75	100
	TOTAL			**30**	**24**	**-**	**-**	**-**	**800**

V	III	Core Course -V (CC)	Embedded Systems and IoT	5	5	3	25	75	100
		Core Course - VI(CC)	Open Source Software	5	5	3	25	75	100
		Core Course - VII(CC)	Robotics	5	5	3	25	75	100
		Core Practical -V (CP)	Robotics Lab	4	4	3	40	60	100
		Major Based Elective – I (Any one)	1. Virtual Reality and Augmented Reality 2. Fuzzy Logic and Neural Networks	5	5	3	25	75	100
	IV	Skill Based Elective I	Mobile Application Development	4	2	3	25	75	100
		Soft Skills Development		2	2	3	25	75	100
	TOTAL			**30**	**28**	**-**	**-**	**-**	**700**
VI	III	Core Course - VIII (CC)	Human Computer Interaction	6	6	3	25	75	100
		Core Course -IX (CC)	Machine Learning	6	6	3	25	75	100
		Core Practical - VI(CP)	Machine Learning Techniques Lab	4	4	3	40	60	100
		Major Based Elective - II (Any one)	1. Natural Language Processing 2. Deep Learning	5	5	3	25	75	100
		Project		4	3	-	20	80	100
	IV	Skill Based Elective – II	Cloud Computing	4	2	3	25	75	100
	V	Gender Studies		1	1	3	25	75	100
		Extension Activities **		-	1	-	-	-	-
	VI	Naan Mudhalvan Scheme (NMS) @@		-	-	-	-	-	-
		TOTAL		**30**	**28**	**-**	**-**	**-**	**700**
GRAND TOTAL				**180**	**152**	**-**	**-**	**-**	**4400**

List of Allied Courses

First Allied Course	Second Allied Course
Mathematics	Applied Physics

$ For those who studied Tamil upto 10th +2 (Regular Stream).

+ Syllabus for other Languages should be on par with Tamil at degree level.

Those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part- I should study special Tamil in Part – IV.

The Professional English – Four Streams Course is offered in the 2nd and 3rd Semester (only for 2022-2023 Batch) in all UG Courses. It will be taught apart from the Existing hours of teaching / additional hours of teaching (1 hour /day) as a 4 credit paper as an add on course on par with Major Paper and completion of the paper is must to continue his / her studies further. (As per G.O. No. 76, Higher Education (K2) Department dated: 18.07.2020).

* The Extra 6 hrs / cycle as per the G.O. 76/2020 will be utilized for the Add on Professional English Course.

@ NCC Course is one of the Choices in Non-Major Elective Course. Only the NCC cadets are eligible to choose this course. However, NCC Course is not a Compulsory Course for the NCC Cadets.

** Extension Activities shall be outside instruction hours.

@@ Naan Mudhalvan Scheme.

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	Part	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	8	40	800
4.		Core Practical	7	29	700
5.		Allied Courses I & II	4	16	400
6.		Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Add on Courses	2	8	200
9.		Project	1	3	100
10.	IV	Non-Major Elective Courses (Practical)	2	4	200
11.		Skill Based Elective Courses	2	4	200
12.		Soft Skills Development	1	2	100
13.		Value Education	1	2	100
14.		Environmental Studies	1	2	100
15.	V	Gender Studies	1	1	100
16.		Extension Activities	1	1	--
17.	VI	Naan Mudhalvan Scheme	2	4	200
	Total		**45**	**2**	**4400**

PROGRAM OBJECTIVES:

- Upon completion of this undergraduate programme on B.Sc. Artificial Intelligence and Machine Learning, the students will be able to
- Exhibit good domain knowledge and completes the tasks with expected quality standards.
- To be capable of modelling, designing, implementing and verifying a computing system to meet specified requirements for the benefit of society.
- Design and develop research based solutions for complex problems.
- To possess critical thinking, communication skills, teamwork, leadership skills and ethical behaviour necessary to function productively and professionally.
- Able to apply analytical and critical thinking to identify, formulate and analyse complex problems
- Establish the ability to listen, read, proficiently communicate and articulate complex ideas.

PROGRAM OUTCOMES:

After successful completion of B.Sc. AI &ML program the students are expected to

- Apply the concepts and practical knowledge in analysis, design and development of computing systems and applications to multi-disciplinary problems.
- Provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in Artificial Intelligence and Machine Learning with ethical values
- Understand, analyze and develop essential proficiency in the areas related to artificial intelligence and machine learning in terms of underlying statistical and computational principles.
- Learn the basic concepts of AI & ML and apply in various research areas like image processing, speech recognition and Medical diagnostics etc.,
- Find solutions to complex AI problems using various AI tools

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First Year **CORE COURSE I** **Semester I**

PROGRAMMING IN C AND DATA STRUCTURES

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To know about the basics of C Programming, Control and Looping Structures and programming with it.
- To understand Arrays, Pointers and String Processing in C language
- To know about the basic concepts in Data Structures.

UNIT - I:

Basic of C: History of C and its importance – Structure of a C program – Data Types – Constants and Variables – Operators and Expressions – Order of Precedence, Evaluating of Arithmetic Expressions – Type Conversion- Decision Statements: if, if-else, and nested if statements.

UNIT - II:

Loops Structures: For Loop, While, Do-while loop – Arrays: - One Dimensional Array, Two-dimensional Arrays, Character Arrays and Strings – Functions: Function with arrays- Function with decision and looping statements - Recursion.

UNIT - III:

Pointers: Introduction – Pointer Expressions – Chain of Pointers – Pointers and Arrays – Array of Pointers – Pointers as function arguments – Functions returning Pointers – Pointers to Functions – Function pointer – Structures - declaration, initialization, Array of Structures – Pointer to structures, Structures and functions – Typed of Enumerated data types, Unions.

UNIT - IV:

Strings Processing, Standard string library functions – Files: introduction and files functions – Writing and reading in Text mode – Simple application: Display the contents of a file. Write data to a file. Append data to an existing file – File IO – Reading and writing structures.

UNIT - V:

Stack: LIFO concept, Stack operations, Array implementation of stack – Queue: FIFO concept, Queue operations, Array implementation of queue – Singly Linked List: concepts, operations – Doubly Linked List: concepts, operations – Trees: General trees, Binary trees.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, New Delhi, Seventh Edition, 2016.
2. E. Horowitz, S. Sahni and Susan Anderson Freed, "Fundamental Data Structures in C", 2ed, Orient Black Swan Publisher, 2009.
3. Byron S. Gottfried, "Programming with C", Schaum's Outline Series, Tata- McGraw Hill Edition, New Delhi, 1991.
4. E. Karthikeyan, "A Textbook on C Fundamentals, Data Structures and Problem Solving", Prentice-Hall of India Private Limited, New Delhi, 2008.
5. Yashavant Kanetkar, "Let us C", BPB Publications, Tenth Edition, New Delhi, 2010.
6. Szuhay, Jeff, and Szuhay, Jeff, "Learn C Programming: A Beginner's Guide to Learning C Programming the Easy and Disciplined Way", Packt Publishing, 2020.
7. Jena, Sisir Kumar, and Jena, Sisir Kumar, "C Programming: Learn to Code", CRC Press, 2021.
8. https://www.tutorialspoint.com/cprogramming/index.htm
9. https://www.w3schools.in/data-structures/intro

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Summarize the basic knowledge to develop C programs
- Manipulate Looping, arrays and functions
- Apply and write programs for solving real world problems
- Create open, read, manipulate, write and close files.
- Understand the basic concepts in data structures.

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First Year **CORE PRACTICAL I** **Semester I**

PROGRAMMING IN C LAB

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To learn the programming knowledge using C language.
- To create derived and user defined data types.
- To demonstrate the functioning of pointers in C.

1. Write a Program
   a. To convert temperature from degree Centigrade to Fahrenheit.
   b. To find whether the given number is Even or Odd.
   c. To find the greatest of three numbers.
2. Write a Program to use the switch statement to display Monday to Sunday.
3. Write a Program to display first Ten Natural Numbers and their sum.
4. Write a Program to find Multiplication of Two Matrices.
5. Write a Program
   a. To find the maximum number in Array using pointer.
   b. To reverse a number using pointer.
   c. To add two numbers using pointer.
6. Write a Program to solve Quadratic Equation using functions.
7. Write a Program to find factorial of a number using Recursion.
8. Write a Program to show Call by Value and Call by Reference.
9. Write a Program to create a file containing Student Details.
10. Write a program to implement a stack using singly linked list, Implement Queue using Linked List.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To relate the ways to solve simple programs
- To understand and trace the execution of programs using arrays
- To develop programs with functions and pointers
- To solve data handling problems using files
- To implement stack and queue operations.

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First Year **CORE COURSE II** **Semester II**

PROGRAMMING IN PYTHON

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To develop programs using functions and pass arguments in Python.
- To write programs using loops and decision statements in Python.
- To design and program Python applications.

UNIT - I:

Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers – Strings – List – Tuple – Set – Dictionary – Data type conversion.

UNIT - II:

Flow Control: Decision Making – Loops – Nested Loops – Types of Loops. Functions: Function Definition – Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

Unit - III:

Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function - The reload() function - Packages in Python - Date and Time Modules. File Handling- Directories in Python.

UNIT - IV:

Object-Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes- Destructors in Python – Encapsulation - Data Hiding – Inheritance - Method Overriding- Polymorphism.

UNIT - V:

Exception Handling: Built-in Exceptions-Handling Exceptions-Exception with Arguments - Raising Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags-Regular Expression Patterns-Character Classes-Special Character Classes - Repetition Cases - findall() method - compile() method.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

An Introduction to Interactive Programming in Python - Study on Julia – an high level language approach.

REFERENCES:

1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co, 2016.
2. Mark Summerfield. — Programming in Python 3: A Complete introduction to the Python Language, Addison-Wesley Professional, 2009.
3. Martin C. Brown, —PYTHON: The Complete Reference‖, McGraw-Hill, 2001
4. Wesley J. Chun, "Core Python Programming", Prentice Hall Publication, 2006.
5. Timothy A Budd, "Exploring Python", Tata McGraw Hill, New Delhi, 2011
6. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly Media, 2016.
7. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016
8. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python –Revised and updated for Python 3.2, Network Theory Ltd., 2011.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To recall and understand the features of python programming language
- To illustrate various programming mechanism used in python
- To apply various language construct to write simple programs in python
- To examine the application of object oriented concept in python
- To distinguish the various constructs used in python.

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First Year **CORE PRACTICAL II** **Semester II**

PROGRAMMING IN PYTHON LAB

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To develop the Numbers, Math functions and Strings.
- To create different Decision Making statements and Functions.
- To design GUI Applications in Python**.**

1. Write a python program that displays the following information: Your name, Full address Mobile number, College name, Course subjects.
2. Write a python program to find the largest three integers using if-else and conditional operator.
3. Write a python program that asks the user to enter a series of positive numbers (The user should enter a negative number to signal the end of the series) and the program should display the numbers in order and their sum.
4. Write a python program to find the product of two matrices [A]mxp and [B]pxr
5. Write recursive functions for GCD of two integers.
6. Write recursive functions for the factorial of positive integer.
7. Write recursive functions for Fibonacci Sequence up to given number n.
8. Write recursive functions to display prime number from 2 to n
9. Write a python program that writes a series of random numbers to a filefrom 1 to n and display
10. Write a python program to sort a given sequence: String, List and Tuple.
11. Write a python program to make a simple calculator.
12. Write a python program for Linear Search and Binary Search

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To recall and relate the features of python programming language
- To compare various programming mechanism used in python
- To construct simple programs in python using various language features
- To distinguish the various constructs used in python
- To apprise the application of object oriented concept in python

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BHARATHIDASAN UNIVERSITY **TIRUCHIRAPPALLI - 620 024**

PART-IV VALUE EDUCATION COURSE

FOR ALL UG ARTS, SCIENCE, COMMERCE AND MANAGEMENT
CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)
(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

First Year	**PART-IV**	**Semester-I**
	VALUE EDUCATION	
Code:	**(Theory)**	**Credit: 2**

OBJECTIVES:

- To understand the philosophy of life and values through Thirukural
- To analyse the components of values education to attain the sense of citizenship
- To understand different types of values towards National Integration and international understanding
- To learn yoga as value education to promote mental and emotional health
- To understand human rights, women rights and other rights to promote peace and harmony

UNIT I : PHILOSOPHY OF LIFE AND SOCIAL VALUES:

Human Life on Earth (Kural 629) -Purpose of Life (Kural 46) -Meaning and Philosophy of Life (Kural 131, 226) -Family (Kural 45), Peace in Family (Kural 1025) Society (Kural 446), The Law of Life (Kural 952), Brotherhood (Kural 807) Five responsibilities / duties of Man (a) to himself (b) to his family (c) to his environment (d) to his society, (e) to the Universe in his lives (Kural 43, 981).

UNIT-II – HUMAN VALUES AND CITIZENSHIP

Aim of education and value education: Evolution of value oriented education, Concept of Human values: types of Values- Character Formation – Components of Value education- A P J Kalam's ten points for enlightened citizenship- The role of media in value building

UNIT-III VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT:

Constitutional or national values: Democracy, socialism, secularism, equality, Justice, liberty, freedom and fraternity - Social Values: Pity and probity, self-control, universal brotherhood - Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith -Religious Values: Tolerance, wisdom, character - Aesthetic Values- Love and appreciation of literature and fine arts and respect for the same- National Integration and International Understanding.

UNIT IV : YOGA AND HEALTH:

Definition, Meaning, Scope of Yoga - Aims and objectives of Yoga - Yoga Education with modern context - Different traditions and schools of Yoga - Yoga practices: Asanas, Pranayama and Meditation.

UNIT V : HUMAN RIGHTS:

Concept of Human Rights: Indian and international perspectives- Evolution of Human Rights- definitions under Indian and International documents -Broad classification of Human Rights and Relevant Constitutional Provisions: Right to Life, liberty ad Dignity- Right to equality- Right against exploitation- Cultural and Educational Right- Economic Rights- Political Rights- Social Rights - Human Rights of Women and Children – Peace and harmony.

UNIT - VI: CURRENT CONTOURS: (for continuous internal assessment only):

BOOKS FOR REFERENCES:

1. Thirukkural with English Translation of Rev. Dr. G.U. Pope, Uma Publication, 156, Serfoji Nagar, Medical College Road, Thanjavur 613 004
2. திருக்குறள் - ஜி.யு.போப் - ஆங்கில மொழியாக்கத்துடன் உமா நூல், வெளியீட்டகம், தஞ்சாவூர்,
3. Leah Levin, Human Rights, NBT, 1998
4. V.R. Krishna Iyer, Dialetics and Dynamics of Human Rights in India, Tagore Law Lectures.
5. Yogic Thearpy - Swami Kuvalayananda and Dr.S.L.Vinekar, Government of India, Ministry of Health, New Delhi.
6. SOUND HEALTH THROUGH YOGA - Dr.K.Chandrasekaran, Prem Kalyan Publications, Sedaptti, 1999.
7. Grose. D. N – "A text book of Value Education' New Delhi (2005)
8. Gawande . EN – "Value Oriented Education" – Vision for better living. New Delhi (2002) Saruptsons
9. Brain Trust Aliyar- "Value Education for Health, Happiness and Harmony" Erode (2004) Vethathiri publications

COURSE OUTCOMES: After completion of the course, the student will be able to:

- Apply the values in thirukural to be peaceful, dutiful and responsible in family and society
- Develop character formation and sense of citizenship
- Be secular, self-control, sincere, respectful and moral.
- Master yoga, asana and meditation to promote mental health
- Be attitudinal to follow the constitutional rights

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BHARATHIDASAN UNIVERSITY **TIRUCHIRAPPALLI - 620 024**

PART-IV ENVIRONMENTAL STUDIES COURSE

FOR ALL UG ARTS, SCIENCE, COMMERCE AND MANAGEMENT
CHOICE BASED CREDIT SYSTEM – LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)
(Applicable to the candidates admitted from the academic year 2022-2023 onwards)

First Year	**PART-IV**	**Semester-II**
	ENVIRONMENTAL STUDIES	
Code:	**(Theory)**	**Credit: 2**

COURSE OBJECTIVES:

- To appreciate the scope of Environmental Studies, Community ecology and the interdisciplinary nature of environmental issues
- To have a basic knowledge of Natural resources its classification, concepts, and natural resources of India.
- The course designed to gain knowledge on values of biodiversity and conservation on global, national, and local scales
- To study about sources and effects of environmental pollution like air, water, soil, thermal, marine, nuclear and noise
- To understand the concerns related to Sustainable Development on environment and health
- To introduce the students in the field of Law and Policies and Acts both at the national and international level relating to environment.

UNIT-1: The Multidisciplinary nature of environmental studies
Definition, scope and importance. (2 lectures)
Need for public awareness

UNIT-2: Natural Resources:
Renewable and non-renewable resources:
Natural resources and associated problems.

a) Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resources, land degradation, man induced Landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit: 3 Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession.
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:-
- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit: 4 Biodiversity and its conservation

- Introduction – Definition : Genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Biological Diversity Act 2002/ BD Rules, 2004

(8 lectures)

Unit: 5 Environmental Pollution

Definition

Causes, effects and control measures of :

a. Air Pollution
b. Water Pollution
c. Soil Pollution
d. Marine Pollution
e. Noise pollution
f. Thermal Pollution
g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.
- Ill-Effects of Fireworks: Firework and Celebrations, Health Hazards, Types of Fire, Firework and Safety

(8 lectures)

Unit: 6 Social Issues and the Environment

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.

Case studies

- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and Control of Pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation
- Public awareness.

(7 lectures)

Unit: 7 Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights - Value Education

- HIV/ AIDS - Women and Child Welfare
- Role of Information Technology in Environment and human health
- Case studies.

Unit: 8 Field Work

- Visit to a local area to document environmental assets-river / forest/ grassland/ hill / mountain

References:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt ltd, Ahamedabad – 380013, India, E-mail: mapin@icenet.net(R)
3. Brunner R.C. 1989, Hazardous Waste Incineration, McGraw Hill Inc 480 p
4. Clark R.S. Marine Pollution, Clanderson Press Oxford (TB)
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7. Down to Earth, Centre for Science and Environment (R)
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9. Hawkins, R.E. Encyclopedia of India Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press 1140 p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
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13. Mhaskar A.K. Matter Hazardous, Techno-Science Publications (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
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16. Rao MN & Datta, A.K. 1987 Waste Water treatment, Oxford & IBH Publication Co. Pvt Ltd 345 p.
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19. Townsend C. Harper, J and Michael Begon, Essentials of Ecology, Blackwell science (TB)
20. Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R).
21. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB).
22. Wagner K.D. 1998 Environmental Management. W.B. Saunders Co. Philadelphia USA 499 p

    (M) Magazine (R) Reference (TB) Textbook

23. http://nbaindia.org/uploaded/Biodiversityindia/Legal/33%20Biological%20Diversity%20

Rules,%202004.pdf.

COURSE OUTCOMES:

- Understand the environmental importance including interactions across local to global scales.
- The learners to update and analyze environmental relationships and interactions of environmental components
- The student to gain knowledge on importance of natural resources in a systematic way.

- The course content is introduce the concept of renewable and non-renewable energy resources and its scenario in India and at global level
- The students will know the relationship between biodiversity and ecosystem functions, direct and indirect values of biodiversity resources and their bioprospecting opportunities.
- The learners can gain awareness related on environmental pollution, causes and pollution control with case studies.
- Student to obtain the environmental ethics and gain knowledge about the sustainable development.
- Learners should realize the environmental legislation and policies of national and international regime and know the regulations applicable to industries and other organizations with significant Environmental aspects

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PROFESSIONAL ENGLISH FOR PHYSICAL SCIENCES-I

OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

LEARNING OUTCOMES:

- Recognise their own ability to improve their own competence in using the language
- Use language for speaking with confidence in an intelligible and acceptable manner
- Understand the importance of reading for life
- Read independently unfamiliar texts with comprehension
- Understand the importance of writing in academic life
- Write simple sentences without committing error of spelling or grammar

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

UNIT 1: COMMUNICATION

1. **Listening**: Listening to instructions

2. **Speaking**: Telephone etiquette and Official phone conversations

3. **Reading** short passages (3 passages, one from each – Physics, Chemistry, Mathematics/Computer Science)

5. **Writing:** Letters and Emails in professional context

6. **Grammar in Context:**
   - Wh and yes or no,
   - Q tags
   - Imperatives

7, **Vocabulary in Context:** Word formation - .
   i) Creating antonyms using Prefixes
   ii) Intensifying prefixes (E. g inflammable)

Changing words using suffixes

A) Noun Endings
B) Adjective Endings
C) Verb Endings

UNIT 2: DESCRIPTION

Listening – Listening to process description

Speaking - Role play

Formal: With faculty and mentors in academic environment, workplace communication

Informal: With peers in academic environment, workplace communication

Reading –Reading passages on products, equipment and gadgets

Writing – Writing sentence definitions (e.g. computer) and extended definitions (e.g. artificial intelligence)

Picture Description – Description of Natural Phenomena

Grammar in Context: Connectives and linkers.

Vocabulary – Synonyms (register) - Compare & contrast expressions.

UNIT 3: NEGOTIATION STRATEGIES

Listening - Listening to interviews of specialists / inventors in fields (Subject specific)

Speaking – Brainstorming. (mind mapping). Small group discussions (subject-specific)

Reading – longer Reading text. (Comprehensive passages)

Writing – Essay Writing (250 word essay on topics related to subject area, like pollution, use of pesticides in cultivation, merits and demerits of devices like mobile phones, merits and demerits of technology in development)

Grammar in Context: Active voice & Passive voice – If conditional - Collocations –Phrasal verbs

UNIT 4: PRESENTATION SKILLS

Listening - Listening to presentation. Listening to lectures. Watching – documentaries (discovery / history channel)

Speaking –Short speech

- Making formal presentations (PPT)

Reading – Reading a written speech by eminent personalities in the relevant field /Short poems / Short biography.

Writing - Writing Recommendations

Interpreting visuals - charts / tables/flow diagrams/charts

Grammar in Context – Modals

Vocabulary (register) - Single word substitution

UNIT 5: CRITICAL THINKING SKILLS

Listening - Listening to advertisements/news and brief documentary films (with subtitles)

Speaking – Simple problems and suggesting solutions.

Reading: Motivational stories on Professional Competence, Professional Ethics and Life Skills (subject-specific)

Writing Studying problem and finding solutions- (Essay in 200 words)

Grammar-Make simple sentences

Vocabulary -Fixed expressions

SUGGESTED ACTIVITIES

UNIT 1

Listening: Links for formal conversation can be given - Gap filling exercises – Multiple Choice questions – Making notes.

Speaking - Role play activity

Reading – Note making. Note-Taking.

Writing: Guided Writing (developing hints)

Email

Grammar: Vocabulary – Worksheets – Games.

UNIT 2

Listening-

Process Descriptions (Processes of Condensation and Evaporation./Process of Measuring the thickness of a wire using a Screw -Gauge./process of Exaction of sugar from sugarcane)

Speaking – Role Play

Reading – Multiple choice questions - Evaluative answers – Classifying and labeling

Writing - Picture description – Description of natural phenomena (rainbow, earthquake, volcanic eruption, erosion, natural disasters in 150 to 200 words).

Vocabulary: Expansion of compound nouns

UNIT 3

Listening- Gap fill exercises – Listening comprehension

Speaking -Debates

Reading -Reading comprehension

Writing – Essay Writing

Grammar - Vocabulary, Activities, Worksheets & Games.

UNIT 4

Listening - Note taking (of listening & viewing items) - Filling a table based on the listening item.

Speaking – JAM, Presentations. (PPT-TECHNICAL)

Reading-Reading comprehension

Writing– Difference between recommendations and instructions

Questions/MCQs based on graphs/flow diagrams/charts

Grammar: Vocabulary – Activities, Worksheets & Games.

UNIT 5

Listening – Radio News/ TV-News telecast /

Speaking - Watch or listen to documentaries and ask questions

Reading - Reading motivational stories (success stories in subject area)

Writing - Essay writing.

Grammar -Vocabulary –Activities, Worksheets & Games

Second Year	CORE COURSE III RDBMS AND NOSQL	Semester III
Code:	(Theory)	Credit: 4

COURSE OBJECTIVES:

- To know the basic concepts about database, its concepts, applications, data models, schemas and instances.
- To gain knowledge about database system architecture, the relational data model and about SQL.
- To Know about NoSQL and data models in NoSQL

UNIT - I:

Introduction to Databases : Databases and Database Users - Introduction - Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications

UNIT - II:

Database System Concepts and Architecture : Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems - The Relational Data Model and SQL : The Relational Data Model and Relational - Database Constraints - Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations

UNIT - III:

Basic SQL : SQL Data Definition and Data Types - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL - Additional Features of SQL - More SQL: Complex Queries, Triggers, Views, and Schema Modification - More Complex SQL Retrieval Queries - Specifying Constraints as Assertions and Actions as Triggers - Views (Virtual Tables) in SQL - Schema Change Statements in SQL

UNIT - IV:

NoSQL : The Value of Relational Databases - Impedance Mismatch - Application and Integration Databases - Attack of the Clusters - The Emergence of NoSQL - Aggregate Data Models : Aggregates - Key-Value and Document Data Models - Column-Family Stores - Summarizing Aggregate-Oriented Databases.

UNIT - V:

Details on Data Models: Relationships - Graph Databases - Schemaless Databases - Materialized Views - Modeling for Data Access - Distribution Models:

Single Server - Sharding Master-Slave Replication - Peer-to-Peer Replication - Combining Sharding and Replication**.**

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Fundamentals of Database System By Elmasari & Navathe- Pearson Education, 7th Edition, 2017
2. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Sadalage, P. & Fowler, Wiley Publications, 1st Edition ,2019.
3. Bipin Desai, An Introduction to Database System Galgotia Publications, 1981
4. S.K. Singh Database System: concept, Design & Application, Pearson Education, 2011
5. leon & leon, Database management system, Vikas publishing House, 2009
6. Toby J. Teorey, Sam S. Lightstone, Tom Nadeau, Database Modeling and Design: Logical Design, Elsevier India Publications, 2005
7. Gillenson, Fundamentals of Database Management System, Wiley, 2008

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To know about databases and about database users.
- To understand the concept of Database system structure and the concept of Relational model.
- To know about SQL.
- To know about the Emergence of NoSQL.
- To understand about data models in NoSQL.

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Second Year	**CORE PRACTICAL III**	**Semester III**
	RDBMS AND NOSQL LAB	
Code:	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To practise the relational database functions using various operations
- To write queries in SQL to retrieve any type of information from a data base.
- To be able to understand unstructured table creation and processing using NoSQL.

Demonstrate the following SQL commands and can take any back end RDBMS system for implementation purpose.

1. Write a SQL query for creating Table, and SQL queries for inserting, deleting, updating the records in Table.
2. Write SQL Queries for AND/OR/NOT operation, Union- Intersection and Minus
3. Write SQL queries for various Join Operations.
4. Write SQL query for Sorting and Grouping the records.
5. Write Nested queries, Sub queries using SQL.
6. Write a SQL program using Built-in functions.
7. Create a view and access the view using query.
8. Creation of unstructured table contents using Nosql commands

COURSE OUTCOMES:

Upon successful completion of this course, the students would be able:

- To work on database queries.
- To relate the entity relationship and join dependencies with software programs
- Write queries on aggregate functions, subqueires.
- Create structured and unstructured database using SQL and NoSQL
- Able to implement various functions of NoSQL.

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Second Year **CORE COURSE IV** **Semester IV**

ARTIFICIAL INTELLIGENCE

Code: **(Theory)** **Credit: 4**

COURSE OBJECTIVES:

- To gain a basic idea of AI and AI related problem solving, inference, perception, knowledge representation, and learning.
- To know about the Heauristic search techniques and about knowledge representation in AI
- To know about Predicate Logic and about Reasoning in AI

UNIT - I:

Artificial Intelligence: AI Problems – Underlying Assumption – AI Technique – Level of the Model – Criteria of Success – Some General References. Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the Design of Search Programs.

UNIT – II:

Heuristic Search Techniques: Generate and Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction – Means-ends Analysis. Knowledge Representation Issues: Representations and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem.

UNIT - III:

Using Predicate Logic: Representing Simple Facts in Logic – Representing Instance and ISA Relationships – Computable Functions and Predicates – Resolution – Natural Deduction - Representating Knowledge Using Rules: Procedural Versus Declarative Knowledge – Logic Programming – Forward Versus Backward Reasoning – Matching – Control Knowledge.

UNIT - IV:

Symbolic Reasoning Under Uncertainty: Introduction to Non-monotonic Reasoning – Logics for Non-monotonic Reasoning – Implementation Issues – Augmenting a Problem-solver – Implementation Depth First Search – Implementation Breadth First Search. Statistical Reasoning: Probability and Baye's Theorem – Certainty Factors and Rule- based Systems – Bayesian Networks – Dempster-Shafer Theory – Fuzzy Logic

UNIT - V:

Semantic Nets- Frames.- Conceptual Dependency – Scripts – CYC. - Syntactic-Semantic Spectrum of Representation – Logic and Slot-and-Filler Structures – Other Representational Techniques.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2017
2. M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers Inc.; First Edition, 2008.
3. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009.
4. Gerhard Welss, - Multi Agents Systems, Second Edition, 2013
5. David L. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.
6. Dan W. Patterson, "Introduction to AI and ES", PearsonEducation,2007

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To understand the basic idea of artificial intelligence and its application areas.
- To apply basic principles of AI in solutions that requires problem solving, inference, perception, knowledge representation, and learning.
- To demonstrate awareness and a fundamental understanding of various applications of AI techniques.
- To understand about Logic programming and about Reasoning related to AI.
- To know about the different representational techniques in AI.

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Second Year **CORE PRACTICAL IV** **Semester IV**

ARTIFICIAL INTELLIGENCE LAB

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- To impart knowledge about the practical aspects in Artificial Intelligence related problems
- To program different AI methods using a programming language
- To know how the logical operations and reason based AI problems are used using programming

1. Write a program to implement the Hill Climbing problem
2. Write a program to implement the Towers of Hanoi problem
3. Write a program to implement the Missionaries and Cannibals problem
4. Write a program to implement the 8 queens problem
5. Write a program to implement the A* Algorithm
6. Write a program to Implement the Breadth first algorithm
7. Write a program to implement the Depth first algorithm
8. Write a program to implement the predicate logic

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- Solve various kinds of problems using AI techniques.
- Solve basic AI based problems using any programming language.
- Understand to implement the various kinds of AI based algorithms.
- Apply AI techniques to real-world problems to develop intelligent systems.
- To understand problems related to AI.

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Second Year **NON MAJOR ELECTIVE COURSE- I** **Semester-III**

TOUR OPERATIONS

Code: **(Theory)** **Credit: 2**

OBJECTIVES:

- To know the definition and concepts of tourism
- To understand the types of travel formalities
- To learn the Preparation of Tour Itinerary

UNIT- I TRANSPORT INDUSTRY:

Introduction to Transport Industry – Road Transport – Rail Transport - Cruise Liners Transportation - Reading of Railway Time Table – Railway Ticket Booking Procedures.

UNIT-II AIR TRANSPORT:

Development of Air Transport – Formation of IATA – Airline Industry (International and Domestic) - Role of Airlines in Tourism.

UNIT-III TRAVEL FORMALITIES:

Passport – VISA – Medical Certificates – Insurance – Customs - Foreign Exchange -Baggage allowance.

UNIT-IV TRAVEL AGENCY:

Evolution of Travel Agency – Departments and Functions of a Travel Agency - Source of income for Travel Agency.

UNIT-V TOURS OPERATIONS:

Origin of Tour Operations – Organising a Tour Program – Package Tours – Car Rentals – Tourist Guide Service -Preparation of Tour Itinerary – Tour Costing.

UNIT - VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Railway Ticket Booking Procedures - Baggage allowance - Organizing a Tour Program - Preparation of Tour Itinerary.

REFERENCE BOOKS:

1. Burkart and Melik, **Tourism -Past, Present and Future**, London, 1995.
2. R.M. Kaul, **Dynamics of Tourism** – **A Triology**, Vol.I., New Delhi, 1997.
3. Seth Pran Nath, Successful Tourism Practices, Vol.I., New Delhi, 1997.
4. Lonely Planet India, Guidebook, Travel literature

COURSE OUTCOME:

- Successful completion of this course will lead the students to appropriate knowledge in Tour operations.

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Second Year **NON MAJOR ELECTIVE COURSE-II** **Semester-IV**

CULTURAL TOURISM

Code: **(Theory)** **Credit: 2**

OBJECTIVES:

1. To gain the knowledge of Cultural Resources.
2. To understand the idea of Cultural Festivals
3. To get the knowledge of Cultural destinations.

UNIT- I CULTURAL TOURISM:

Definition - Meaning and Scope - Significance – Types of CulturalTourism Attractions - Culinary Traditions: North Indian - South Indian -Continental.

UNIT-II ARTS AND CRAFTS :

Music: Hindustani - Carnatic -Classical Dances: Kuchipudi, Odisi, Kathakali, Manipuri,Kadhak and Bharathanattiyam - Folk Dances.

UNIT-III CULTURAL RESOURCES OF NORTH INDIA :

Madura- Jaipur-Vaishnavadevi Temple Deccan Region: Konark – Amaravati- Somnathpur Temple -South India : Belur, Helibidu, Gurauvayur, Thiruppati- Madurai- Case studies: Darasuram, Velankanni.

UNIT-IV FESTIVALS:

Konark Festival in Odisha - Sarang Festival in Kolkata - Music Festival in Chennai- -Dance Festivals in Mamallapuram and Chidambaram - Music Festival in Thiruvaiyaru.

UNIT-V INDIAN CULTURAL DESTINATION – CULTURAL INSTITUTION IN INDIA:

Cultural Event Management – Preservation and Conservation of Monuments – Role of ASI, ICO, MOS -Mutts in India- Unique features of Tamil Culture: Chastity, Equality, Nobility, Charity , Justice.

UNIT - VI CURRENT CONTOURS (For Continuous Internal Assessment Only):

Hindustani Music - Culinary traditions of South India - Konark Festival–Role of ASI in heritage conservation.

REFERENCES :

1. V.s. Agarwal, the Heritage of Indian Art, Publications Divisions, Govt. of India, New Delhi.
2. A.L. Basham, The Wonder That was India, 3rd edition, London.
3. L. Basham, A Cultural History of India, Oxford University Press, New Delhi.
4. பண்டையநாகரிகங்கள் - எஸ்.எல். வி . மூர்த்தி
5. Art, Culture and Spirituality - Swami Atmaramananda&Dr.M.Sivaramkrishna.
6. The Book of Hindu Festivals and Ceremonies - Om Lata Bahadur.
7. Cultural Tourism In India- Luvkushmishra

COURSE OUTCOME:

- Successful completion of this course will lead the students to appropriate knowledge in Cultural Tourism.

Professional English [part-III -add on Course]

Weightage: 4 Credits Duration: 90hrs

Objectives:

The Professional Communication Skills Course is intended to help Learners in Arts and Science colleges

- Develop their competence in the use of English with particular reference to the workplace situation.
- Enhance the creativity of the students, which will enable them to think of innovative ways to solve issues in the workplace.
- Develop their competence and competitiveness and thereby improve their employability skills.
- Help students with a research bent of mind develop their skills in writing reports and research proposals.

Unit 1- Communicative Competence (18 hrs)

Listening – Listening to two talks/lectures by specialists on selected subject specific topics -(TED Talks) and answering comprehension exercises (inferential questions)

Speaking: Small group discussions (the discussions could be based on the listening and reading passages- open ended questions

Reading: Two subject-based reading texts followed by comprehension activities/exercises

Writing: Summary writing based on the reading passages.

Grammar and vocabulary exercises/tasks to be designed based on the discourse patterns of the listening and reading texts in the book. This is applicable for all the units.

Unit 2 - Persuasive Communication (18 hrs)

Listening: listening to a product launch- sensitizing learners to the nuances of persuasive communication

Speaking: debates – Just-A Minute Activities

Reading: reading texts on advertisements (on products relevant to the subject areas) and answering inferential questions

Writing: dialogue writing- writing an argumentative /persuasive essay.

Unit 3- Digital Competence **(18 hrs)**

Listening to interviews (subject related)

Speaking: Interviews with subject specialists (usingvideo conferencing skills)

Creating Vlogs (How to become a vlogger and use vlogging tonurture interests – subject related)

Reading: Selected sample of Web Page (subject area)

Writing: Creating Web Pages

Reading Comprehension: Essay on Digital Competence for Academic and Professional Life.

The essay will address all aspects of digital competence in relation to MS Office and how they can be utilized in relation to work in the subject area

Unit 4 - Creativity and Imagination **(18 hrs)**

Listening to short (2 to 5 minutes) academic videos (prepared by EMRC/ other MOOC videos on Indian academic sites – E.g. https://www.youtube.com/watch?v=tpvicScuDyo)

Speaking: Making oral presentations through short films – subject based

Reading: Essay on Creativity and Imagination (subject based)

Writing – Basic Script Writing for short films (subject based)

- Creating blogs, flyers and brochures (subject based)
- Poster making – writing slogans/captions(subject based)

Unit 5- Workplace Communication& Basics of Academic Writing (18 hrs)

Speaking: Short academic presentation using PowerPoint

Reading & Writing: Product Profiles, Circulars, Minutes of Meeting.

Writing an introduction, paraphrasing

Punctuation(period, question mark, exclamation point, comma, semicolon, colon, dash, hyphen, parentheses, brackets, braces, apostrophe, quotation marks, and ellipsis)

Capitalization (use of upper case)

Outcomes of the Course.

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

- Attend interviews with boldness and confidence.
- Adapt easily into the workplace context, having become communicatively competent.
- Apply to the Research &Development organisations/ sections in companies and offices with winning proposals.

Instruction to Course Writers:

1. **Acquisition of subject-related vocabulary should not be overlooked**. Textboxes with relevant vocabulary may be strategically placed as a Pre Task or in Summing Up
2. Grammar may be included if the text lends itself to the teaching of a Grammatical item. However, testing and evaluation does not include Grammar.

Third Year	CORE COURSE V EMBEDDED SYSTEM AND IOT	Semester V
Code:	(Theory)	Credit: 5

COURSE OBJECTIVES:

- To expose the students about the fundamentals of Embedded System.
- To discuss on aspects required in embedded system design techniques.
- To understand the fundamentals of Internet of Things.

UNIT - I:

Embedded System vs General Computing System - Classification of Embedded System, Purpose of Embedded system, Quality Attributes of Embedded System - Typical Embedded System- Core of Embedded System, Memory, Sensors and Actuators, Communication Interface- Onboard communication interface, External communication interface.

UNIT - II:

Embedded Firmware Design Approaches- Embedded Firmware Development Languages - Embedded System Development Environment - IDE, Compiler, Linker - Types of File Generated on Cross Compilation-Simulator, Emulator and Debugging- Fundamental issues in Hardware Software Co-design- Integration and Testing of Embedded Hardware andFirmware.

UNIT - III:

Introduction-Characteristics - Physical design - protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs. M2M. IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT - IV:

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services. Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs and Hacks. Various Real time applications of IoT-Connecting IoT to cloud – Cloud Storage for IoT

UNIT - V:

IoE – Overview – Architecture-Smart objects and LLNs-Secure mobility. Home automation – Cities: Smart parking – Environment: Weather monitoring – Agriculture: Smart irrigation – Data analytics for IoT – Software & management tools for IoT cloud storage models & Communication APIs – Cloud for IoT – Amazon Web Services for IoT.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Shibu K.V, “Introduction to Embedded System”, Tata McGraw-Hill, 2014.
2. Unit -1: Chapters 1 & 2.1 to 2.4, Unit-2: Chapters 2.5, 7, 9, 12, 13.
3. Internet of things – A Hands on approach, Arshdeep Bahga, Vijay Madisetti
4. Unit-3: Chapters 1,2,3,4,5, Unit-4: Chapters 7,8,9,10, Unit-5: Chapters 9,10, 11,13
5. David E. Simon, “An Embedded Software Primer”, Pearson Education Asia, Addison Wesley, 2001. Dr. M. Kalaiselvi Geetha, Professor in CSE, FEAT, Annamalai University Page 217
6. Marilyn Wolf, Computers as Components, Principles of Embedded Computing System Design”, Morgan Kaufmann Publishers, Third edition, 2012.
7. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
8. Manoel Carlos Ramon, “Intel Galileo and Intel Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
9. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To understand the embedded system design process and embedded firmware concepts.
- To understand the fundamental issues I hardware and software co-design.
- To learn physical and logical design, IoT levels, and IoT design methologies.
- To understand tools for IoT cloud storage models & Communication APIs
- To understand the Communication APIs, Cloud for IoT, Amazon Web Services for IoT.

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Third Year	**CORE COURSE VI**	**Semester V**
	OPEN SOURCE SOFTWARE	
Code:	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- To explain the need and importance of open source software
- To introduce the various open source software's like Linux, MySQL, PHP and Python
- To provide a built-in community that continuously modifies and improves the source code.

UNIT - I:

Introduction to open sources–Need of open sources–advantages of open sources – application of opensources. Open source operating systems: LINUX: Introduction – general overview –Kernel mode and user mode–process–advanced concepts –scheduling–personalities–cloning–signals–developmentwith Linux..

UNIT - II:

MySQL: Introduction –setting up account –starting,terminating and writing your own SQL programs -record selectionTechnology – working with strings – Date and Time – sorting Query results – generating summary – working with meta data–using sequences– MySQL and Web.

UNIT - III:

PHP: Introduction–programming in web environment–variables- constants–data types –operators –statements – functions – arrays – OOP – string manipulations and regular expression – file handling and data storage–PHP and SQL database– PHP and LDAP – PHP connectivity – sending and receiving E-mails –debugging and error handling– security–templates

UNIT - IV:

Syntax and style– python objects – numbers – sequences–strings–lists and tuples–dictionaries–conditional loops–files–input and output–errors and exceptions–functions–modules–classes and OOP – execution environment

UNIT - V:

Pearl back grounder – pearl overview–pearl parsing rules–variables and data– statements and control structures– subroutines-,packages and modules– working with files– data manipulation.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Remy Card, Eric and Frank Mevel ,The Linux Kernel Book, ,Wiley Publications, 2003 Unit-1: Chapters 1,2,3,4, 5
2. Steve Suchring, John, MySQL Bible, Wiley, 2002. Unit-2: Chapters 1,6,7,9,11 & 12
3. Rasmus Lerdorf and Levin Tatroe, Programming PHP, O Reilly, 2002
4. Unit-3: Chapters 1,2,3,4,5,8, & 12
5. Wesley J. Chun, Core Python Programming, Prentice Hall, 2001
6. Unit-4: Chapters 1,2,3,4, 5 & 7
7. Martin C. Brown, Perl: The Complete Reference,2nd Edn, TMH, 2009
8. Unit-5: Chapters 1,2,5,6,7 & 8
9. Vikram Vaswani, MySQL: The Complete Reference, 2ndEdn,TMH,2009

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To explain common open source licenses and the impact of choosing a license.
- To explain open source project structure and how to successfully setup a project.
- To be competent with distributed software engineering tools and processes such as test-driven development, issues tracking, unit testing, code review, distributed version control, and continuous integration.
- To work on an open source project and will be expected to make a significant contribution.
- To study common open source software licenses, open source project structure, distributed team software development, and current events in the open source world.

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Third Year	**CORE COURSE VII ROBOTICS**	**Semester V**
Code:	**(Theory)**	**Credit: 5**

COURSE OBJECTIVES:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming.

UNIT - I:

Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT-II:

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT - III:

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT - IV:

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT - V:

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCE BOOKS:

1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003. (Unit 1 : Chapter 1 & 2, Unit II: Chapter 4, Unit III: Chapter 5, Unit IV: Chapter 3 & 8, Unit V: Chapter 9)
2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.
3. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
4. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
5. Fu.K.S.,Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
6. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
7. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the fundamentals of robots.
- Know the concepts of sensors and machine vision.
- Understand navigation controls for operating robotics.
- Understand the planning and navigation of obstacle avoidance.
- Understand the implementation of robot economics.

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Third Year	**CORE PRACTICAL V ROBOTICS LAB**	**Semester V**
Code:	**(Practical)**	**Credit: 4**

COURSE OBJECTIVES:

- To Impart Practical Training related to Artificial Intelligence and Robotics and various movements of robots through hands on training.
- Open source platforms used to experiment the kinematics
- It helps to perform robotics tasks execution using computer vision.

List of Experiments:

1. Determination of maximum and minimum position of links.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
3. Estimation of accuracy, repeatability and resolution.
4. Robot programming and simulation for pick and place
5. Robot programming and simulation for Colour identification
6. Robot programming and simulation for Shape identification
7. Robot programming and simulation for machining (cutting, welding)
8. Robot programming and simulation for writing practice
9. Robot programming and simulation for any industrial process (Packaging, Assembly)
10. Robot programming and simulation for multi process.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand various graphical function for bot functioning.
- Gain more knowledge and hands on training on robot movement programming.
- Understand the implementation of open source platforms.
- Implement the robotics tasks execution.
- Implement kinematics based experiment and know any robotic simulation software to model the different types of robots and calculate work volume for different robots.

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

1. VIRTUAL REALITY AND AUGMENTED REALITY

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations, case studies and applications with a futuristic vision along with socio-economic impact and issues.
- To understand virtual reality, augmented reality and using them to build Biomedical engineering applications.
- To know the intricacies of these platform to develop PDA applications with better optimality

UNIT - I:

INTRODUCTION: The three I's of virtual reality-commercial VR technology and the five classic components of a VR system - Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three-dimensional position trackers, navigation and manipulation-interfaces and gesture interfaces-Output Devices: Graphics displays-sound displays & haptic feedback.

UNIT - II:

VR DEVELOPMENT PROCESS: Geometric modeling - kinematics modeling-physical modeling - behavior modeling - model Management.

UNIT - III:

CONTENT CREATION CONSIDERATIONS FOR VR: Methodology and terminology-user performance studies-VR health and safety issues-Usability of virtual reality system- cyber sickness -side effects of exposures to virtual reality environment

UNIT - IV:

VR ON THE WEB & VR ON THE MOBILE: JS-pros and cons-building blocks (WebVR, WebGL, Three.js, device orientation events)- frameworks (A-frame, React VR)-Google VR for Android-Scripts, mobile device configuration, building to android-cameras and interaction-teleporting-spatial audio-Assessing human parameters-device development and drivers-Design Haptics

UNIT - V:

APPLICATIONS: Medical applications-military applications-robotics applications-Advanced Real time Tracking- other applications- games, movies, simulations, therapy

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, Gregory, John Wiley & Sons, Inc., 2008.
   Unit-1: Chapters 1,2,3, Unit-2: Chapter 5, Unit-3: Chapter 7, Unit-4: Chapter 7, Unit-5: Chapter 8
2. Jason Jerald. 2015. The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA.
3. Augmented Reality: Principles and Practice (Usability) by Dieter Schmalstieg & Tobias Hollerer, Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016. ISBN: 9780321883575
4. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability),Steve Aukstakalnis, Addison-Wesley Professional; 1 edition, 2016.
5. The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything, Robert Scoble & Shel Israel, Patrick Brewster Press; 1 edition, 2016.
6. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, Tony Parisi, O'Reilly Media; 1 edition, 2015.
7. Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages, Tony Parisi, O'Reilly Media; 1 edition, 2014.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the basics of VR and AR
- Analyse & Design a system or process to meet given specifications with realistic engineering constraints.
- Identify problem statements and function as a member of an engineering design team.
- Utilize technical resources
- Propose technical documents and give technical oral presentations related to design mini project results.

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Third Year **MAJOR BASED ELECTIVE I** **Semester V**

2. FUZZY LOGIC AND NEURAL NETWORKS

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To introduce the concepts of neural networks and fuzzy systems
- To explain the basic mathematical elements of the theory of fuzzy sets.
- Understand the context of neural networks and deep learning. Know how to use a neural network

UNIT - I:

Introduction: What is a Neural Networks:-Artificial Neural Networks- Biological Neural Networks- Where are neural nets being used? - Signal Processing-Control-Pattern Recognition- Medicine- Speech Production-Speech Recognition-Business-How Are Neural Networks Used- Typical Architectures -Setting the Weights-Supervised training – unsupervised training – Fixed-weight nets-Common Activation Functions.

UNIT - II:

Developing Neural Networks: The 1940s: The Beginning of Neural Nets-The 1950s and1960s: The First Golden Age of Neural Networks-The 1970s The Quiet years-The 1980s Enthusiasm. When Neural Nets Began?-The McCulloch-Pitts Neuron: Architecture-Algorithm-Applications.

UNIT - III:

Simple Neural Nets for Pattern classification-General Discussion: Architecture-Biases and Thresholds-Linear separability - Data Representation. Hebb Net:-Algorithm - Application. Perceptron – Architecture – Algorithm - Application Adaline: Architecture – Algorithm – Applications - Madaline.- Architecture - Algorithm-Applications-

UNIT-IV:

Fuzzy Set Theory: Fuzzy versus Crisp. Crisp Sets: Operations on Crisp Sets-Properties of Crisp sets- Partition and covering – Rule of Addition – Rule of Inclusion-Fuzzy Sets: Membership.

UNIT - V:

Basic Fuzzy Set Operations-Properties of Fuzzy sets. Crisp Fuzzy Relations: Fuzzy Cartesian product-Operations on Fuzzy Relations. Fuzzy logic-Fuzzy Proposition-Fuzzy Rule based System-Fuzzy logic-Defuzzification

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Fausett, L. V. (1993). Fundamentals of neural networks: Architectures, algorithms and applications: United States edition. Pearson. Unit I : Chapter1 Unit II : Chapters 1.5, 1.6, 1.7, Chapter 2, Unit III : Chapter 2
2. Rajasekaran, S., & Pai, G. A. V. (2007). Neural networks, fuzzy logic, and genetic algorithms: Synthesis and applications. New Delhi: Prentice Hall.Unit IV Chapter 6, Unit V: Chapters 7
3. Haykin, S. S. (1994). *Neural networks: A comprehensive foundation*. Macmillan.
4. Valluru, S. K., & Rao, T. N. (2010). *Introduction to neural networks, fuzzy logic & genetic algorithms*. Jaico Publishing House.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the basic concept of fuzzy sets, fuzzy logic defuzzification
- Learn basics of Artificial Neural of theory and programming of Microprocessors
- Analyze various techniques in feedback and feed forward Neural networks.
- Understand the principle of competitive neural networks Adaptive resonance theory
- Learn the architecture and algorithm of Cognitron, Neo cognitron The concepts of fuzzy associative memory and fuzzy systems.

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Third Year **SKILL BASED ELECTIVE I** **Semester V**

MOBILE APPLICATION DEVELOPMENT

Code: **(Theory)** **Credit: 2**

COURSE OBJECTIVES:

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Implement the design using specific mobile development frameworks

UNIT-I:

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT - II:

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT - III:

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications

UNIT - IV:

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT - V:

TECHNOLOGY II – IOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, Dream Tech, 2012
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
5. Development: Exploring the iOS SDK”, Apress, 2013.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Describe the requirements for mobile applications
- Explain the challenges in mobile application design and development
- Develop design for mobile applications for specific requirements
- Implement the design using Android SDK
- Implement the design using Objective C and iOS and deploy mobile applications in Android and iPone marketplace for distribution

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Third Year **CORE COURSE VIII** **Semester VI**

HUMAN COMPUTER INTERACTION

Code: **(Theory)** **Credit: 6**

COURSE OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities and be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT - I:

FOUNDATIONS OF HCI: The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT - II:

DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT - III:

MODELS AND THEORIESHCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models- Hypertext, Multimedia and WWW.

UNIT - IV:

MOBILE HCI: Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT - V:

WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009. (UNIT-V)
4. Human-Computer Interaction: Fundamentals and Practice, Gerard Jounghyun Kim, CRC Press, 2015
5. M.G. Helander, Handbook of Human-Computer Interaction, Elsevier Science, 2014.
6. Kim, Gerard Jounghyun. Human-Computer Interaction: Fundamentals and Practice, CRC Press, 2015.
7. Biele, Cezary. Human Movements in Human-Computer Interaction (HCI), Springer International Publishing,2021
8. Cognitive Behavior and Human Computer Interaction Based on Machine Learning Algorithms, Wiley, 2021.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To design effective dialog for HCI
- To design effective HCI for individuals and persons with disabilities.
- To assess the importance of user feedback.
- To explain the HCI implications for designing multimedia / ecommerce / e-learning Web sites.
- To develop meaningful user interface.

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Third Year	CORE COURSE IX MACHINE LEARNING	Semester VI
Code:	(Theory)	Credit: 6

COURSE OBJECTIVES:

- To facilitate the basics of machine learning concepts.
- To learn building a machine learning model from the scratch
- To understand the evaluation of models.

UNIT - I:

Introduction: Introduction, easy for human hard for machines, a simple predicting machine, classifying is not very different from predicting, training a simple classifier, one classifier is not enough, Types of machine learning, Applications of Machine Learning, Perspectives and issues in machine learning.

UNIT - II:

Probabilistic and Stochastic Models: Bayesian Learning – Bayes theorem, Concept learning, Maximum likelihood, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Expectation maximization and Gaussian Mixture Models, Hidden Markov models

UNIT - III:

Supervised learning: Introduction, Regression, Linear regression, Classification: Decision trees, k-Nereast Neighbours, Support Vector Machine, Logistic regression, Random Forest. Artificial Neural Network: Introduction, Perceptrons, multi-layer networks and back propagation.

UNIT - IV:

Unsupervised learning: Introduction, Supervised vs Unsupervised Cluster Analysis, K-means clustering, Hierarchical clustering. Dimension reduction: Principal Component Analysis, Linear Discriminant Analysis

UNIT - V:

Modelling and evaluation: Building the model, Training a model, evaluating a model, improving a model. Performance metrics - accuracy, precision, recall, sensitivity, specificity, AUC, RoC, Bias Variance decomposition.

Unit – VI Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, ―Machine Learning, Pearson Education.(Unit1: Chapter1:.4,1.5,1.7,1.9; Unit 2: Chapter 6; Unit 3: Chapter 7, 8, 10; Unit 4 Chapter 9 (9.1,9.4), Unit 5: Chapter 3;)
2. Ethem Alpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014. (Unit2: Chapter 7, Chapter 15)
3. Tariq Rashid, "Make your own neural network", Create Space Independent Publishing Platform, US 2016, ISBN:978-1-5308-2660-5 (Unit1, Part1)
4. Shai Shalev-Shwartz, Shai Ben-David, ― Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.
5. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer.
6. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
7. C. Bishop, "Pattern Recognition and Machine Learning", Springer.
8. Sebastian Raschka and Vahid Mirjalili, "Python Machine Learning", Packt Publishing, Third Edition, 2019

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Explain machine learning
- Apply machine learning concepts in various domains
- Implement supervised, unsupervised learning techniques
- Differentiate supervised and unsupervised learning techniques
- Create and evaluate models

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Third Year **CORE PRACTICAL VI** **Semester VI**

MACHINE LEARNING TECHNIQUES LAB

Code: **(Practical)** **Credit: 4**

COURSE OBJECTIVES:

- Make use of Data sets in implementing the machine learning algorithms
- To Impart Practical Training in Machine Learning.
- It focuses on providing hands on training to implement various kinds applications using the tools.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a.CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and pply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data sets to redasa .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes / API can be used to write the program. Calculate the accuracy, precision, and recall for your dataset.

Course Outcomes:

Upon successful completion of this course the students would be able:

- To understand the implementation procedures for the machine learning algorithms
- To design Java/Python programs for various Learning algorithms.
- To apply appropriate data sets to the Machine Learning algorithms.
- To identify and apply Machine Learning algorithms to solve real world problems.
- To understand to Implement character recognition using Multilayer Perceptron.

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

1. NATURAL LANGUAGE PROCESSING

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics and to apply the NLP techniques to IR applications

UNIT - I:

INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT - II:

WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT - III:

SYNTACTIC ANALYSIS: Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT - IV:

SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, sectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT - V:

DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co-reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, Word Net, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

Unit – VI Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.1. Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Java‖, O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language
4. Processing, Second Edition, Chapman and Hall/CRC Press, 2010. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information
5. Retrieval‖, Oxford University Press, 2008.
6. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

Course Outcomes:

Upon successful completion of this course the students would be able:

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

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Third Year **MAJOR BASED ELECTIVE II** **Semester VI**

2. DEEP LEARNING

Code: **(Theory)** **Credit: 5**

COURSE OBJECTIVES:

- To provide the fundamental concepts in deep learning.
- It provides the massive datasets and affordable computing, enabling new applications in computer vision and natural language processing.
- Students can able to design, implement, and train these models to solve real-world problems.

UNIT - I:

The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron–FF Neural Networks–Types of Neurons –Soft max output layers

UNIT - II:

Tensor flow–Variables–Operations–Placeholders–Sessions–Sharing Variables – Graphs–Visualization

UNIT - III:

Convolution Neural Network – Feature Selection–Max Pooling–Filters and Feature Maps–Convolution Layer–Applications

UNIT - IV:

Recurrent Neural Network –Memory cells–sequence analysis–STM—Memory augmented Neural Networks–NTM—Application

Unit – VI Current Contours (for Continuous Internal Assessment Only):

Reinforcement Learning –MDP–Q Learning– Applications

Unit-VI:

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Nikhil Buduma, Nicholas Locascio, ―Fundamentals of Deep Learning: Designing Next Generation Machine Intelligence Algorithms‖ O'Reilly Media, 2017. Unit-1: Chapter 1, Unit-2: Chapter 3, Unit-3: Chapters 5, Unit-4: Chapters 7, 8Unit-5: Chapter 9.
2. Lan Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning (Adaptive computation and Machine Learnings eries ‖,MITPress,2017.
3. Goodfellow, Ian, Deep Learning, MIT Press, 2016.
4. Gibson, Adam, and Patterson, Josh,Deep Learning: A Practitioner's

Approach, O'Reilly Media, 2017.
5. Charniak, Eugene, Introduction to Deep Learning, MIT Press, 2019.
6. Locascio, Nicholas, and Buduma, Nikhil, Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, O'Reilly Media, 2017.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- Understand the convolution, recurrent and other neural network architectures for deep learning.
- Implement deep learning models in Python using the PyForch library and train them with real world datasets.
- Gain knowledge on various tools used for deep learning and its applications
- Understand the recurrent neural networks with attention mechanisms for natural language classification, generation, and translation.
- Understand how to evaluate the performance of different deep learning models.

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Third Year **PROJECT** **Semester-VI**

Code: **Credit: 3**

The candidate shall be required to take up a Project Work by group or individual and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the students in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT/EVALUATION/VIVA VOCE:

1. PROJECT REPORT EVALUATION (Both Internal & External)

   I. Plan of the Project - 20 marks

   II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc. and presentation of the report. - 45 marks

   III. Individual initiative - 15 marks

2. Viva-Voce / Internal & External - 20 marks

TOTAL **- 100 marks**

PASSING MINIMUM:

	Vivo-Voce 20 Marks	**Dissertation 80 Marks**
Project	40% out of 20 Marks (i.e. 8 Marks)	40% out of 80 marks (i.e. 32 marks)

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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Third Year	**SKILL BASED ELECTIVE II CLOUD COMPUTING**	**Semester VI**
Code:	**(Theory)**	**Credit: 2**

COURSE OBJECTIVES:

- To learn the basics of cloud computing, to implement the key concept of virtualization.
- To inculcate the knowledge of different cloud computing services and security and to apply Map-Reduce concept of applications and amazon web services
- To understand how to migrate the applications in cloud

UNIT - I:

Introduction-History of Cloud Computing – Characteristics of Cloud – Cloud Computing Model – Issues and Challenges for Cloud Computing – Advantages and disadvantages of Cloud Computing – Security Privacy and Trust – Virtualization – Threats to Cloud Computing – Next Generation of Cloud computing - Cloud Computing Architecture: Cloud Architecture – Cloud Computing Models – Comparisons of Models – Deployment Models – Identity as a Service.

UNIT - II:

Virtualization – Implementation of virtualization – Virtualization Support at The OS Level – Middleware Support For Virtualization – Advantages of Virtualization – Virtualization Implementation Techniques – Hardware Virtualization - Types of Virtualization – Load Balancing in Cloud Computing – Logical Cloud Computing Model – Virtualization for Data-Centre .

UNIT - III:

Security Reference Architecture – Security Issues in Cloud Computing – Classification of Security issues - Types of Attacks – Security Risks in Cloud Computing – Security Threats against Cloud Computing - Emerging trends in Security and Privacy.

UNIT - IV:

Amazon Web Services – Microsoft Azure - Google App Engine – Data Security - Privacy – Service Oriented Architecture Components – Design Principle of SOA – SOA Requirements – Benefits of SOA – Web Services .

UNIT - V:

Motivations for Migration – Issues in Migrating the Applications to the Cloud – Types of Migration - Planning for Migrating the application to Cloud – Migration Road Map.

Unit – VI Current Contours (for Continuous Internal Assessment Only):

Trends on cloud computing such edge computing, serverless computing, Kubemetes – study of cloud examples (Microsoft Azure, Icloud, salesforce, IBMcloud, VMware

REFERENCES:

1. "Cloud Computing" – V.K. Pachghare PHI Delhi Learning Private Limited, 2016. ISBN: 978-81-203-5213-1 [Unit– I: Chapter 1,2; Unit– II: Chapter 3; Unit – III: Chapter 5; Unit – IV: Chapter 7,9; Unit – V: Chapter 10;]
2. Sharma, Rishabh," Cloud Computing Fundamentals, Industry Approach and Trends", New Delhi: John Wiley, 2017, ISBN: 978-81-265-5306-8
3. Chitra, D,"Grid and Cloud Computing ", D. Chitra and A. Kaliappan, Jodhpur: Scientific Publishers (India), 2016, ISBN: 978-93-85983-05-4
4. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
5. Michael Miller "Cloud Computing Web based application that change the way you work and collaborate online". Pearsonedition, 2008.
6. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning,2012.

COURSE OUTCOMES:

Upon successful completion of this course the students would be able:

- To define cloud computing and memorize the different cloud service and deployment models.
- To apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- To use and examine different cloud computing services.
- To design different workflows according to requirements and apply Map-Reduce programming model.
- To analyze the components of open stack& Google cloud platform Understand mobile cloud computing and migrating strategies for cloud applications

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CODE OF CONDUCT FOR STUDENTS

1. Students should not leave the College premises during class hours without written permission of the Principal / Competent authority.
2. Students should be punctual in attending classes and other co-curricular and extra-curricular activities. Late comers will not be allowed in the class.
3. Students will be responsible for all equipment entrusted to them. Students should not cause any damage to any property, equipment, instruments, tools etc., of the College. An amount of Rs.150 towards General maintenance, is payable by each Student at the end of the Academic Year, prior to Examinations. In case of any damage, the actual cost will be recovered from the student along with a fine.
4. Students should take care of their belongings while within the campus. The College will not be responsible for any loss of such belongings.
5. Use of Mobile phones, Pagers, Cameras, etc., are prohibited inside the campus, during College hours, from 10am to 4pm. If found in contravention, they will be confiscated.

   Smoking and consumption of pan is prohibited inside the campus. Consumption of any intoxicants or drugs is totally prohibited, and will lead to immediate dismissal from the College.
6. Students should display their Identity Card prominently, while they are within the campus and while travelling in the College bus. The security staff will not permit any student inside the campus without their identity card.
7. All Students should dress in a presentable manner. T-shirts and sleeveless dresses are not permitted.
8. The management reserves the right to modify the class timings and schedule.
9. Students should not hold any meetings or collect any money from other students without proper permission from the Principal / HOD.
10. Students should not involve themselves in any political or religious activity inside the Campus.

    Ragging in any form is totally banned and is punishable as per the Government Order. If any student is found to be indulging in any sort of ragging or harassment to juniors or other fellow students, inside or outside the campus, bus, he/she will be dismissed immediately from the College, and criminal action will be taken against them as per the rules.
11. The following acts of misconduct will result in immediate dismissal from the College:

    (i) Assault of any person
    (ii) Willful damage to College property
    (iii) Intimidation, coercion and/or interference with other students
    (iv) Misbehavior with other students and/or Staff

12. The decision of the Principal decision is final and binding on all the students, in all matters pertaining to the College.
13. All other rules, regulations and guidelines prescribed by University / Government agencies will be implemented.
14. Attendance
    1. Absence from class without proper reason and without prior permission from the HOD is tantamount to breach of discipline and such absence will attract punishment and should be avoided. One period of absence in the forenoon or afternoon session will be treated as half a day of absence.
    2. Absence for more than 10 days without prior permission from the HOD may lead to removal from the nominal roll.
    3. Students appearing for the University examinations must have at least 80% of attendance as per the rules of the University. A minimum of 70% attendance is required to appear for examinations.

RULES OF CONDUCT AND DISCIPLINE

1. All students should conduct themselves with DECENCY, DECORUM and DIGNITY at all times and in all places.
2. Students must co-operate in protecting and taking care of all college property and equipments. They are expected to keep the building, playfield and their rooms neat and tidy.
3. Difficulties experienced by the students and suggestions for improving their welfare may be brought to the notice of the principal or any other staff member for consideration and necessary action.
4. Students who want to participate in matches and competitions not conducted by the college can do so only after getting the permission of the principal.
5. Students are forbidden from taking any part in political activities of any kind particularly those directed against the authority of the government.
6. Students who are found damaging college property will be expelled from the college. If any damage to the college property is caused by the student who is not identified minimum collective fine of Rs.100/- per student will be levied at the end of the year.

RULES REGARDING ATTENDANCE & LEAVE OF ABSENCE

1. A Candidates other then private one shall be required to put in seventy five percent to qualify for admission to any prescribed examination of the university.
2. If a student is absent for one or more hours during a session (Forenoon or afternoon) he/she will lose the attendance for half-a-day.
3. The Principal of the college shall have a power to condone shortage of attendance of students to be admitted for university examinations upto a maximum of a 10 percent, ie., nine days each semester on valid reasons as ill health etc., on payment of the prescribed condonation fee of Rs.500/-.

4. Statement of attendance of the students shall be displayed in the college notice board every month.
5. In case the shortage of attendance of a student exceeds the limit prescribed for purpose of condonation of attendance, he/she will not be presented to the University examinations.
6. A student will be given only one opportunity to carry forward the deficiency in attendance of one semester to the next semester during the degree course, failing which he/she will have to re-do the course.

DISCIPLINE REGULATIONS

The following rules shall be on force in the college as per the Tamilnadu Educational rules.

1. No Student who has been convicted of any offence in a criminal court will be allowed to continue his studies in the college.
2. Students should abstain from active participation in party or communal politics.
3. Students who indulge in political propaganda or who organize fellow students in to political factions in the premises of the college or who otherwise engage themselves in party politics are liable to be expelled from the college.
4. Principal or other constituted college authorities may frame and issue from time to time disciplinary rules of a permanent or temporary nature relating to the conduct, inside and outside the college premises, of students.
5. Principal and other constituted college authorities shall have full powers to inflict the following punishments in the interest of the students or of the institution concerned fine, denial of attendance, denial of terms certificates, suspensions and expulsion.
6. Students should not indulge in any activity leading to the disruption of peace and discipline and dislocation of normal work in the college premises. Those who are guilty of violation of this rule will be severely dealt with.
7. Ragging is strictly forbidden. Anyone who is guilty of ragging will be severely punished.
8. Students who are guilty of (a) rude language towards the staff of the college or (b) assault or attempt to assault the staff or fellow students of the college, will be expelled from the institution.

RAGGING – WARNING

- Ragging of any sort is banned.
- Ragging is illegal and punishable.
- Ragging in any form at any place in the college campus or outside is strictly prohibited.
- Ragging is punishable with imprisonment upto 7 years with a fine of Rs.25,000. Strict disciplinary action will be taken against any student found indulging in an act of ragging.

- Any complaint about ragging has to be reported to the respective HODs or authorities.
- Ragging of any sort will be informed to the Police authorities.

IDENTITY CARD

Every student will be provided with an identity card with his photo duly attested by the principal. Students are required to keep their identity card with them always.