IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Computer Science & Engineering

Bachelor of Technology (B.Tech.) [Computer Science & Engineering (Data Science)]

IV Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	ESC-CSDS401	ESC	Computer Network	70	20	10	60	40	200	3	–	2	4
2.	PCC-CSDS401	PCC	Computer System Organization	70	20	10	–	–	100	3	1	–	4
3.	PCC-CSDS402	PCC	Object Oriented Programming & Methodology	70	20	10	60	40	200	2	–	4	4
4.	PCC-CSDS403	PCC	Essentials of data science with R software	70	20	10	60	40	200	2	1	2	4
5.	PCC-CSDS404	PCC	Programming in PYTHON	–	–	–	60	40	100	–	–	4	2
6.	HSMC-CSDS401	HSMC	Soft Skill & Interpersonal Communication-I	70	20	10	–	–	100	3	–	–	3
7.	MC-4	MC	Constitution of India/ Essence of Indian Traditional Knowledge	–	–	–	–	–	–	2	–	–	0
			Total	350	100	50	240	160	900	15	2	12	21

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

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IV Semester

ESC-CSDS401	Computer Network	3L: 0T: 2P (5 Hrs.)	Credits:04

Prerequisite: Data Communication

Course Objective: This course provides foundation to understand computer networks using layered architectures.

Course Contents:

Module 1: **(08 hrs.)**

Introduction to computer networks: Network – Component and Categories – Topologies Reference Models: ISO/OSI Model and TCP/IP Protocol suite. Principals of physical layer: Transmission Media, Bandwidth, Multiplexing, Switching, X.25, ISDN.

Module 2: **(08 hrs.)**

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net m o d els.HDLC,ARP/RARP, error detection & correction technique.

Module 3: **(9 hrs.)**

MAC Sublayer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, Binary Count Down, Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Module 4: **(08 hrs.)**

Network L a y e r : Need, Services Provided , Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6.

Module 5: **(10hrs.)**

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

Course Outcome:

1. Describe basics of computer network, network architecture, TCP/IP protocol suite, OSI reference models & fundamentals of physical layer.
2. Classify data link protocol like flow control, error control, bit oriented protocol.
3. Paraphrase multi-channel access protocol, IEEE 802 standards & use Ethernet standards.
4. Explain routing & congestion algorithm. State IP protocol, addressing & subnet.
5. Distinguish various transport & application layer protocols.

List of Text / Reference Books:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks" Pearson New International Edition, 5th Edition,2013.
2. Douglas E Comer, "Internetworking with Tcp/Ip Principles, Protocols, And Architecture -Volume I" 6th Edition, Prentice Hall of India.
3. Dimitri Bertsekas, Robert Gallager, "Data Networks", PHI Publication, Second Edition.
4. Kaveh Pahlavan, Prashant Krishnamurthy, "Networking Fundamentals", Wiley Publication. First Edition,2009
5. Uyless Black, "Computer Networks", PHI Publication, Second Edition.
6. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGrawHill.2011.
7. Behrouz A. Forouzan, "Data Communication and Networking", McGrawHill, 5th Edition, 2013.
8. William Stallings, "Data and Computer Communication" 8th Edition, 2007.
9. W. Richard Stevens. "TCP/IP Illustrated, Volume 1", Addison-Wesley, United States of America.

List of Experiments:

1. Study of Different Type of LAN & Network Equipments.
2. Study Transmission media & standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of farming methods.
6. Study of Tool Command Language (TCL).
7. Study and Installation of Standard Network Simulator: N.S-2, N.S3.OpNet, QualNet etc.
8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
9. Configure 802.11 WLAN.
10. Implement & Simulate various types of routing algorithm.
11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.
12. Study of Application layer protocols-DNS, HTTP, HTTPS, FTP an TelNet.

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IV Semester

PCC-CSDS401	**Computer System Organization**	**3L: 1T: 0P (4 hrs.)**	**Credits: 04**

Prerequisite: Nil

Course Objective:

Students to be familiarize the basic principles of computer architecture, Design and Multi Processing, Types of data transfer, Concept of semi conductor memories which is useful for research work in field Computer System.

Module 1: **(10 hrs.)**

Basic Structure of Computer: Structure of Desktop Computers, CPU: General Register Organization - Memory Register, Instruction Register, Control Word, Stack Organization, Instruction Format, ALU, I/O System, bus, CPU and Memory Program Counter, Bus Structure, Register Transfer Language-Bus and Memory Transfer, addressing modes. Control Unit Organization: Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch and Execution cycle, Hardwired control unit, Micro-programmed Control unit micro program sequencer Control Memory, Sequencing and Execution of Micro Instruction.

Module 2: **(08 hrs.)**

Computer Arithmetic: Addition and Subtraction, Tools Compliment Representation, Signed Addition and Subtraction, Multiplication and division, Booths Algorithm, Division Operation, Floating Point Arithmetic Operation, Number concept 1's and 2's complement representation, addition and subtraction using 2's complement.

Module 3: **(08 hrs.)**

I/O Organization: I/O Interface–PCI Bus, SCSI Bus, USB, Data Transfer: Serial, Parallel, Synchronous, Asynchronous Modes of Data Transfer, Direct Memory Access (DMA), I/O Processor.

Module 4: **(08 hrs.)**

Memory Organization: Main memory-RAM, ROM, Secondary Memory –Magnetic Tape, Disk, Optical Storage, Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm, Improving Cache Performance, Virtual Memory, memory management hardware.

Module 5: **(08 hrs.)**

Multiprocessors: Characteristics of Multiprocessor, Inter-Processor Communication and Synchronization. Memory in Multiprocessor System, Concept of Pipelining, Vector Processing, Array Processing, RISC and CISC, Study of Multicore Processor –Intel, AMD.

Course Outcome:

1. Explain the basic structure & components of the computer system, Microprogrammed Control Unit.
2. Demonstrate the concepts of computer arithmetic.
3. Explain the input output organization of the computer system.
4. Illustrate memory organization and memory management techniques.
5. State the core concepts of multiprocessor and pipelining.

List of Text Books / Reference Books:

1. Morris Mano., “Computer System Architecture” 3rd Ed., 2007, PHI
2. Alan Clements: “Computer Organization and Architecture”, 2012, Cengage Learning
3. Subrata Ghosal: “Computer Architecture and Organization”, 2011, Pearson Education
4. William stalling, “Computer Organization and Architecture” 10th Ed., 2016, Pearson Education
5. M. Usha, T.S. Shrikant: “Computer System Architecture & Organization”, 2019, Willey India
6. Chaudhuri, P.Pal: “Computer Organization and Design”, 3rd Ed. PHI

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IV Semester

PCC-CSDS402	Object Oriented Programming & Methodology	2L: 0T: 4P (6 hrs.)	Credits:04

Prerequisite: Foundation of C language

Course Objective:

The course is designed to provide complete knowledge of Object Oriented Programming through and to enhance the programming skills of the students by giving practical assignments to be done in labs. Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm.

Module 1: **(08 hrs.)**

Introduction to Object Oriented Programming, Comparison with Procedural Programming, features of Object oriented paradigm, merits and demerits of OO methodology; Introduction to Java Development Kit (JDK) & Java virtual machine (JVM); Linker & Loader; Data Encapsulation: Concept of Classes & Objects; State, Behavior & Identity of an object.

Module 2: **(08 hrs.)**

Data Abstraction and Message Passing: Methods, Calling of constructors, Decision making constructs, Control loops, Keywords: this, static; Access modifiers, Arrays within a class, String Class.

Module 3: **(10 hrs.)**

Relationship between classes: Generalization- Inheritance, Types of Inheritance, Ambiguity in multiple inheritances, Concept of interfaces; Specialization- Association, Aggregation and Composition; Static and Dynamic Binding: Polymorphism, Method Overriding & Overloading; Keywords: super, abstract, final.

Module 4: **(08 hrs.)**

Concept of Packages, Need of package; Basic idea of exception handling, stack based execution and exception propagation, Exception types: Exception Handling Try, Catch, Finally, Throw statement, Assertions.

Module 5: **(08 hrs.)**

Overview of Simple threads, Basic idea of Multithreaded Programming, Thread synchronization: Locks, synchronized methods, synchronized block, thread scheduling, Producer-consumer relationship, Daemon thread, Case Study: Chabot implementation etc.

Course Outcome:

1. Understand object oriented programming concepts, core JAVA and apply them in solving Problems.
2. Develop skill in data abstraction and message passing.
3. Understand fundamentals of relationship amongst objects.
4. Learn about the need of exception and errors.
5. Develop ability to write a computer program to solve specified problems.

List of Text Books / Reference Books:

1. G. Booch, "Object Oriented Analysis & Design", Pearson.
2. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001.
3. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
4. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
5. Herbert Schildt, "Java 2: The Complete Reference", 7th Edition, McGraw-Hill.

List of Experiments:

1. A gardener plants a daisy flower and observes that on the first day the flower has 1 petal, on the second day the flower has 2 petals, on the third day it has 3 petals, on fourth day it has 5 petals, on fifth day it has 8 petals. Write a program to calculate how many petals will be there on the daisy flower on ninth day?
2. The Marks obtained by the class of 10 students are 45,50,66,32,80,77,59,63,71,85 respectively. Write a program for following:

- Arrange and print the marks in descending order
- Calculate the average marks of the class
- Find out whether any student got 95 marks (if yes print –"Student exist" and if no print – "Student doesn't exist")

3. WAP for the following calculating

- Sum of square of given even numbers from 1 to 20
- Sum of square of given odd numbers from 21 to 40

4. In the school while prayer assembly the 12 std boys and girls heights (in feet) are: Boys – 5.3, 5.6, 6.3, 5.9, 5.11
   Girls – 5.1, 5.9, 5.0, 5.5, 5.6
   Write a program for finding:

- Tallest height in boys
- Tallest height in girl
- Tallest height in the class
- Is there any student having height above 6.2 feet (o/p True or False)
- How many boys have height between 5.5 and 5.9 feet

5. Create an abstract class Account. Inherit this class into two classes as Current Account and Saving Account. Identify the below attributes & methods and place them in suitable classes so as achieve best outcomes:

- Attributes: Name_of_customer, Address, MobileNo, type_of_account, balanceAmt, etc.
- Methods: withdrawal, deposit, displayInfo, viewBalance, calculateInterest (saving 6% & current 1%).

6. Write a program which does following on a given String. Count the number of occurrence of a particular character. (e.g. "assassinations" here „s" had come 5 times)

7. Write a program that takes a string (e.g. “apple is a fruit”). Obtain a substring from this string but starting from a second occurrence of a particular character (suppose. „a‟) then output should be (“a fruit”).
8. WAP to check weather a given string is a substring of other string. (e.g. “drinking “and other string is “packages drinking water” so here first string a substring of second hence the result must be TRUE).
9. Write a java program showing the concept of keywords this in java.
10. Write a java program showing the concept of constructor in java.
11. Write a java program showing the concept of Inheritance, super keyword & Interfaces in java.
12. Write a java program showing the concept of file handling in java.
13. Write a java program showing the concept of multithreading in java.
14. Write a java program showing the concept of exception handling in java.

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IV Semester

PCC- CSDS403	**Essentials of data science with R software**	**2L: 1T: 2P (5 hrs.)**	**Credits:04**

Prerequisite: Engineering Mathematics.

Course Objective:

Course Objective: The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis using R Programming which is mostly used in varied applications in engineering

Module 1: **(08 hrs.)**

Introduction to basic concepts of R programming language, Introduction to Probability , Sample Space and Events , Set Theory and Events using Venn Diagrams , Relative Frequency and Probability , Probability and Relative Frequency - An Example , Axiomatic Definition of Probability , Some Rules of Probability , Basic Principles of Counting- Ordered Set, Unordered Set, and Permutations , Basic Principles of Counting- Combination , Conditional Probability , Multiplication Theorem of Probability, Bayes' Theorem , Independent Events ..

Module 2: **(10 hrs.)**

Random Variables - Discrete and Continuous , Cumulative Distribution and Probability Density Function , Discrete Random Variables, Probability Mass Function and Cumulative Distribution Function , Expectation of Variables, Moments and Variance , Skewness and Kurtosis , Quantiles and Tschebyschevâ€™s Inequality .

Module 3: **(08 hrs.)**

Degenerate and Discrete Uniform Distributions, Bernoulli and Binomial Distribution, Poisson Distribution , Geometric Distribution , Continuous Random Variables and Uniform Distribution, Normal Distribution, Exponential Distribution , Bivariate Probability Distribution for Discrete Random Variables, Bivariate Probability Distribution for Continuous Random Variables, Examples in Bivariate Probability Distribution Functions .

Module 4: **(10 hrs.)**

Covariance and Correlation , Bivariate Normal Distribution, Chi square Distribution, t - Distribution , F – Distribution, Distribution of Sample Mean, Convergence in Probability and Weak Law of Large Numbers , Central Limit Theorem , Needs for Drawing Statistical Inferences , Unbiased Estimators , Efficiency of Estimators , CramÃ©râ€“Rao Lower Bound and Efficiency of Estimators , Consistency and Sufficiency of Estimators, Method of Moments, Method of Maximum Likelihood and Rao Blackwell Theorem.

Module 5: **(08 hrs.)**

Basic Concepts of Confidence Interval Estimation ,Confidence Interval for Mean in One Sample with Known Variance ,Confidence Interval for Mean and Variance, Basics of Tests of Hypothesis and Decision Rules ,Test Procedures for One Sample Test for Mean with Known Variance ,One Sample Test for Mean with Unknown Variance ,Two Sample Test for Mean with Known and Unknown Variances ,Test of Hypothesis for Variance in One and Two Samples.

List of Text Books / Reference Books:

1. Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R Authors: Heumann, Christian, Schomaker, Michael, Shalabh, Publisher" Springer 2016
2. Applied Statistics and Probability for Engineers, Douglas C. Montgomery, George C. Runger, 2018, Wiley (Low price edition available)
3. Introduction to. Mathematical. Statistics. Robert V. Hogg. Allen T. Craig,, Low price Indian edition by Pearson Education
4. Probability and Statistics for Engineers. Richard A. Johnson, Irwin Miller, John Freund
5. Mathematical Statistics with Applications. Irwin Miller, Marylees Miller, Pearson Education
6. The R Software-Fundamentals of Programming and Statistical Analysis -Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, Springer 2013
7. A Beginner's Guide to R (Use R) By Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, Springer 2009.

List of Experiments:

1. Installation and Working with R.
2. Installation and Working with R Studio.
3. Calculations with R as a Calculator, Calculations with Data Vectors.
4. Built-in Commands and Bivariate Plots.
5. Logical Operators and Selection of Sample.
6. Computation of Probability using R
7. Data Based Moments and Variance in R Software.
8. Discrete Uniform Distribution in R.
9. Binomial Distribution in R.
10. Poisson distribution in R.
11. Geometric Distribution in R.
12. Normal Distribution in R.
13. Chi square Distribution in R
14. Bivariate Probability Distribution in R Software.
15. Covariance and Correlation in R.

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IV Semester

PCC-CSDS404	**Programming in PYTHON**	**0L : 0T : 4P (4 hrs.)**	**Credits:02**

Prerequisite: Nil

Course Objective:

The course is designed to provide Basic knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language. Learning Outcomes: Problem solving and programming capability

Module 1: **(07 hrs.)**

Introduction, History, Features, Python –Environment Setup Local Environment Setup, Getting Python, Installation of Python, Use of IDE

Module 2: **(10 hrs.)**

Python –Basic Syntax Python Identifiers, Reserved Words, Lines & Indentation, Multiline Statements, Quotation in Python, Comments & other useful constructs, Python –Variables Assigning Values to Variables, Multiple Assignment, Standard Data Types

Module 3: **(08 hrs.)**

Python –Variables, Assigning Values to Variables, Multiple Assignment, Standard Data Types; Python Numbers, Python Strings, Python Lists, Python Tuples, Dictionary, Data Type Conversion

Module 4: **(08 hrs.)**

Python –Basic Operators, Types of Operators, Arithmetic Operators, Comparison Operators, Assignment Operators, Bitwise Operators, Logical Operators, Operator Precedence, Python – Decision Making & Loops, Flowchart, If statement Syntax

Module 5: **(08 hrs.)**

Python-Functions, Syntax for defining a function, Calling a Function, Function Arguments, Anonymous Functions Python-Applications & Further Extensions, Data analysis packages.

Course Outcome:

1. Install Python and have knowledge of syntax of Python.
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python. 3.Express different Decision Making statements and Functions.
4. Develop code in Python using functions, loops etc.
5. Design GUI Applications in Python and evaluate different database operations.

List of Text Books / Reference Books:

1. Eric Matthes, “Python Crash Course: A Hands-On, Project-Based Introduction to Programming”, No Starch Press.
2. ZedA. Shaw, “Learn Python the Hard Way” (3rdEdition), Addison Wesley.

3. Paul Barry, “Head-First Python”, O'Reilly.
4. John Zelle, Franklin,”Python Programming”, Beedle & Associates Inc.

List of Experiments:

Write a Python program:

1. To find GCD of two numbers.
2. To find the square root of a number by Newton‟s Method.
3. To find the exponentiation of a number.
4. To find the maximum from a list of numbers.
5. To perform Linear Search
6. To perform binary search.
7. To perform selection sort.
8. To perform insertion sort.
9. To perform Merge sort.
10. To find first n prime numbers.
11. To multiply matrices.
12. For command line arguments.
13. To find the most frequent words in a text read from a file.
14. To simulate elliptical orbits in Pygame.
15. To bouncing ball in Pygame.
16. To demonstrate data analysis packages using python like Pandas, Filtering, etc.

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IV Semester

HSMC-CSDS401	Soft Skills & Interpersonal Communication	3L : 0T : 0P (3hrs.)	Credits:03

Prerequisite: Nil

Course Objectives:

The course will help students to learn effective communication skills, group and team building skills. It will help them to learn the goal setting process and thus become more effective in achieving it.

Module-I
Introduction to Soft Skills
Importance of Soft Skills, Effective Communication Skills, Verbal: Oral and Written, Merits and Demerits. Non Verbal: Kinesics, Proxemics, Haptics, Chronemics, Paralanguage, Sign/Symbol, Meta Communication, and Cultural differences in Non-Verbal Communication

Module-II
Aspects of Communication
Process of Listening, Types of Listening, Barriers to Listening, Strategies to Develop Listening Skills, Listening Comprehension, Culture as Communication, Communicating across Cultures, Communication Breakdown and ways to overcome

Module-III Interpersonal Skills
Introduction and Importance to Interpersonal Skills, Personal Attributes, Interpersonal Attributes, Decision making, Creative Problem Solving, Dealing with Glossophobia, Logical Reasoning Tony Buzan‟s Mind Mapping Techniques: Argumentation, Inductive, Deductive reasoning, Persuasion

Module-IV Group Behavior
Leadership skills, Team Management, Group Dynamics, Negotiation, Assertiveness, Emotional Intelligence

Module-V
Practical Approach to Soft Skills and Interpersonal Skills
Case Studies, SWOC Analysis and Goal Setting, Mindfulness Training, Brain Storming, Group Discussion, Team Building Activities.

Course Outcomes:

The outcome of this course will be to make students aware about the different facets of self. It will also help them learn skills to strengthen their inner capacities so that they are able to understand themselves, think and act effectively to lead.

List of Text Books:

1. Soft Skills by G.S. Chouhan and Sangeeta Sharma, Wiley, New Delhi, 2016 Communication Skills by Sanjay Kumar and Pushplata, OUP, New Delhi, 2011
2. Communication Skill for Engineers and Scientist by Sangeeta Sharma and Vinod Mishra, PHI Learning, New Delhi, 2015
3. Developing Communication Skill by Krishna Mohan, Meera Banerji, McMillan India Limited,2018
4. Effective Listening Skills by Kratz, Abby Robinson. Toronto: ON: Irwin Professional Publishing, 1995.
5. Soft Skill for Everyone by Jeff Butterfield, Cengage Leaning, New Delhi, 2010

List of Reference Books:

1. Theories of Personality by Hall, Calvin S. et al. . New Delhi: Wiley. rpt. 2011.
2. Corporate Conversations by Holtz, Shel. New Delhi: PHI. 2007.
3. The Art of Public Speaking by Lucas, Stephen E. McGraw-Hill Book Co. International Edition, 11th Ed. 2014.
4. Winning at Interviews by Thorpe, Edgar and Showick Thorpe. Pearson Education. 2004.
5. Business Communication for Managers by Penrose, John M., et al. New Delhi: Thomson South Western. 2007

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IV Semester

MC-4	**Constitution of India/ Essence of Indian Traditional Knowledge**	**2L: 0T: 0P (2 hrs.)**	**Credits:00**

Prerequisite: Nil

Course Objective:

The objective of this course is to focus on Indian traditional knowledge.

Module 1: Introduction to Traditional Knowledge (08 hrs.)

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.

Module 2: Protection of Traditional Knowledge (08 hrs.)

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Module 3: Legal Frame Work and TK (08 hrs.)

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act). The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

Module 4: Traditional Knowledge and Intellectual Property (08 hrs.)

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Module 5: Traditional Knowledge in Different Sectors: **(08 hrs.)**

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139.

Course Outcome:

1. Understand the concept of Traditional knowledge and its importance
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.
5. Understand the traditional knowledge in different sectors.

List of Text Books / Reference Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel.