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.)
VII Semester CSE&CSE RL

Scheme

S.No.	Course Type	Course Code	Course Title	Hrs./ Week			Credits
				L	T	P	
1	PCC	CS14	Data Science	2	1	-	3
2	PCC	CS15	Cryptography and Network Security	2	1	-	3
3	PEC	CS02	Professional Elective Course-II	2	1	-	3
4	PEC	CS03	Professional Elective Course-III	2	1	-	3
5	IOC	-	Interdisciplinary Open Course-II	2	1	-	3
6	LC	CS14(P)	DataScience Lab	-	-	2	1
7	PROJ	CS05	Project -II	-	-	8	4
8	PROJ	CS06	Evaluationof Internship-II	-	-	6	3
						Total Credits	23

Professional Elective Course(PEC)–II,CS02(Any One Course)	Professional Elective Course(PEC)–III,CS03 (Any One Course)	Interdisciplinary Open Course(IOC)-II,(Any One Course)
(A) Mobile Application Development	(A)Wireless & Mobile Computing	CL01Information Storage Management
(B) Natural Language Processing	(B)Pattern Recognition	FT (B) Occupation Health and First Aid
(C)Soft Computing	(C) Digital Marketing & SEO	Robotics
(D)Advance Java Programming	(D)Semantic Web &Ontologies	Industrial Electronics

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.)
VII Semester CSE&CSE RL

PCCCS14	Data Science	2L: 1T: 0P (3 hrs.)	3 credits

Course Objective:

The objective of this course is to familiarize students with the roles of a data scientist and enable them to analyze data to derive meaningful information from it.

Course Contents: (40 hrs.)

Module 1: **(06 hrs.)**

Introduction: Definition of Data Science, Big Data and Data Science hype and getting past the hype, Datafication, Current landscape of perspectives, Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model, Over fitting. Basics of R: Introduction, Environment Setup, Programming with R, Basic Data Types.

Module 2: **(12 hrs.)**

Data Collection and Data Pre-Processing Overview of Vectors, Matrices, Factors, Data Frames, Lists and Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization.

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

Exploratory Data Analytics Descriptive Statistics – Mean Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics, ANOVA. Exploratory Data Analysis - Basic tools (plots, graphs, and summary statistics) of EDA, Philosophy of EDA - The Data Science Process.

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

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

Module 5: **(04 hrs.)**

Data Visualization Basics, Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making.

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.)
VII Semester CSE&CSE RL

Course Outcomes:

1. Understanding data and its types for analysis.
2. Describe the data using various statistical measures with understanding of data collection and pre-processing.
3. Use appropriate exploratory data analysis techniques for data science problems.
4. Perform data reduction to solve problems effectively.
5. Apply data science visualization techniques in real-world contexts to communicate these solutions effectively.

List of Text / Reference Books:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
3. Hadley Wickham and Garrett Grolemund, "R for Data Science", O'Reilly, 2017.
4. Machine Learning – Tom M. Mitchell, - MGH.
5. Crawley, M. J. (2006), "Statistics - An introduction using R", John Wiley, London 32.
6. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

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.)
VII Semester CSE&CSE RL

PCCCS15	Cryptography and Network Security	2L: 1T: 0P (3 hrs.)	3 credits

Course Objectives:

1. Understand fundamental security principles and cryptographic techniques, including various types of attacks and encryption methods.
2. Master advanced cryptographic algorithms, network security protocols, and practical applications through real-world case studies.

Course Contents: (40 hrs.)

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

Introduction to Security, The Need for Security, Security Approaches and Principles, Types of SecurityAttacks, Introduction to Cryptography, Plain Text and Cipher Text, Substitution and TranspositionTechniques, Encryption and Decryption Processes, Symmetric and Asymmetric Key Cryptography.

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

Symmetric Key Ciphers, Block Cipher Principles, Overview of DES, AES, Blowfish, RC5, IDEABlock Cipher Operations, Asymmetric Key Ciphers, Principles of Public Key Cryptosystems,RSA Algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange.

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

Cryptographic Hash Functions, Message Authentication and Secure Hash Algorithm (SHA-512) Message Authentication Codes: HMAC, CMAC, Digital Signatures and Elgamal Digital Signature Scheme, Key Management and Distribution, Symmetric Key Distribution Using Symmetric and Asymmetric Encryption, Distribution of Public Keys, Kerberos, Public Key Infrastructure (PKI).

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

Transport-Level Security, Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), HTTPS, Secure Shell (SSH), Wireless Network Security, Wireless Security Overview, Mobile Device Security, IEEE 802.11 Wireless LAN Security.

Module 5: **(8hrs.)**

E-Mail Security, Pretty Good Privacy (PGP), S/MIME, IP Security, IP Security Overview and Architecture, Case Studies on Cryptography and Security: Secure Multiparty Computation, Virtual Elections, Single Sign-On (SSO).

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.)
VII Semester CSE&CSE RL

Course Outcomes:

1. Describe the importance of security and the principles of cryptography.
2. Apply symmetric and asymmetric key cipher techniques.
3. Explain cryptographic hash functions, authentication codes, and digital signatures.
4. Identify transport-level and wireless network security protocols.
5. Implement email and IP security measures and analyze cryptographic case studies forreal-world applications.

List of Text / Reference Books:

1. Cryptography and Network Security: Principles and Practice by William Stallings.
2. Applied Cryptography: Protocols, Algorithms, and Source Code in C by BruceSchneier.
3. Network Security Essentials: Applications and Standards by William Stallings.
4. E-Mail Security: How to Keep Your Electronic Messages Private by Bruce Schneier.
5. IPsec: The New Security Standard for the Internet, Intranets, and Virtual PrivateNetworks by NaganandDoraswamy and Dan Harkins.
6. Cryptographic Hash Functions by B. Preneel.

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.)
VII Semester CSE&CSE RL

PEC- CS02(A)	Mobile Application Development	2L: 1T: 0P (3 hrs.)	3 credits

Course Objectives:

1. To facilitate students to understand android SDK.
2. To help students to gain a basic understanding of Android application development.
3. To inculcate working knowledge of Android Studio development tool.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

Module 2: **(8hrs.)**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

Module 3: **(6hrs.)**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Module 4: **(8hrs.)**

Testing Android applications: Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

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

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

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.)
VII Semester CSE&CSE RL

Course Outcomes:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms.
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution.

List of Text / Reference Books:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
3. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd3.R3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

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.)
VII Semester CSE&CSE RL

PEC CS02(B)	**Natural LanguageProcessing**	**2L:1T:0P(3hrs.)**	**3 credits**

Prerequisite: Engineering Mathematics, Theory of Computation

Course Objectives:

To gain the knowledge for developing advanced technology of computer systems like speech recognition and machine translation.

Course Contents:(40hrs)

Module1: **(06hrs.)**

Introduction to Natural Language Understanding- Levels of language analysis-Syntax, Semantics, Pragmatics, Applications, Ambiguity, Morphology, Parsing with Finite State Transducers, Regular Expressions, Stemmer, Spelling errors.

Module2: **(10hrs.)**

Computational Phonology: speech sound, phonetic transcription, text to speech, Pronunciation Variations, Bayesian Method to spelling and pronunciations, Minimum Edit Distance, Weighted Automata, N-grams.

Module3: **(10hrs.)**

HMM and speech recognition, Viterbi algorithm, Acoustic processing of speech, Feature Extraction, Speech Synthesis; Part-of-Speech Tagging: rule based, stochastic, transformation based.

Module4: **(08hrs.)**

Syntax Processing: Parsing with CFG, CKY parsing and the Earley parser, Probabilistic parsing; Semantic Processing: Meaning representation, First Order Predicate Calculus. Lexical Semantics: Internal structure of words, thematic roles, Primitive decomposition, WordNet.

Module5: **(06hrs.)**

Word sense disambiguation; Information Retrieval: Vector space model, Improving user queries; Pragmatic Processing: Discourse; Natural Language Generation, Machine Translation.

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.)
VII Semester

Course Outcomes:

1. tag a given text with basic Language features.
2. design an innovative application using NLP components.
3. implement a rule-based system to tackle morphology/syntax of a language.
4. Designatagsettobeusedforstatisticalprocessingforreal-timeapplications.
5. Compareandcontrasttheuseofdifferentstatisticalapproachesfordifferenttypes of NLP applications.

List of Text/Reference Books:

1. D.JurafskyandJ.H. Martin,"SpeechandLanguageProcessing;Processing",PrenticeHall,2000.
2. C.ManningandH.Schutze,"FoundationsofStatisticalNaturalLanguageProcessing",MITPress
3. James Allen."Natural Language Understanding", Addison Wesley,1994.
4. Richard M Reese, "Natural Language Processing withJavall",OReilly Media,2015.
5. TanveerSiddiqui,U.S.Tiwary,"NaturalLanguageProcessingandInformationRetrieval", Oxford University Press,2008

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.)
VII Semester

PEC CS02 (C)	Soft Computing	2L: 1T: 0P (3 hrs.)	3 credits

Course Objectives:

The objective of this course is to familiarize the students with different soft computing tools to use them to be able to solve complex problems.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Introduction to Neural Network: Concept, biological neural network, comparison of ANN with biological NN, evolution of artificial neural network, Basic models, Types of learning, Linear separability, XOR problem, McCulloch-Pitts neuron model, Hebb rule.

Module 2: **(6hrs.)**

Supervised Learning: Perceptron learning, Single layer/multilayer, Adaline, Madaline, Back propagation network, RBFN, Application of Neural network in forecasting, data compression and image compression.

Module 3: **(8hrs.)**

Unsupervised learning: Introduction, Fixed weight competitive nets, Kohonen SOM, Counter Propagation networks, (Theory, Architecture, Flow Chart, Training Algorithm and applications). Introduction to Convolution neural networks (CNN) and Recurrent neural networks (RNN).

Module 4: **(8hrs.)**

Fuzzy Set: Introduction, Basic Definition and Terminology, Properties and Set-theoretic Operations, Fuzzy Relations, Membership Functions and their assignment, Fuzzy rules and fuzzy Reasoning, Fuzzy if-then Rules, Fuzzy Inference Systems. Application of Fuzzy logic in solving engineering problems.

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

Genetic Algorithm: Introduction to GA, Simple Genetic Algorithm, terminology and operators of GA (individual, gene, fitness, population, data structure, encoding, selection, crossover, mutation, convergence criteria). Reasons for working of GA and Schema theorem, GA optimization problems like TSP (Travelling salesman problem), Network design routing. Introduction to Ant Colony optimization (ACO) and Particle swarm optimization (PSO).

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.)
VII Semester

Course Outcomes:

1. Understand concept of ANN and explain the XOR problem.
2. Use supervised neural networks to classify given inputs.
3. Understand unsupervised neural networks for clustering data.
4. Build Fuzzy inference system using concepts of fuzzy logic.
5. Obtain an optimized solution to a given problem using genetic algorithm.

List of Text / Reference Books:

1. S.N. Shivnandam, “Principle of soft computing”, Wiley.
2. S. Rajshekaran and G.A.V. Pai, “Neural Network, Fuzzy logic And Genetic Algorithm”, PHI.
3. Jack M. Zurada, “Introduction to Artificial Neural Network System” JAico Publication.
4. Simon Haykins, “Neural Network- A Comprehensive Foudation”
5. Timothy J.Ross, “Fuzzy logic with Engineering Applications”, McGraw-Hills

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.)
VII Semester

PEC CS02(D)	Advanced Java Programming	2L:1T:0P(3 hrs.)	3 credits

Prerequisite: Programming for Problem Solving

Course Objectives: The course is designed to provide complete knowledge of Java Object Oriented Programming through and to enhance the programming skills of the students by giving practical assignments to be done in labs.

Course Content:: (40 hrs.)

Module 1: **(08 Hrs)**

Introduction: Introduction to java Object Oriented Programming, Java Designing Goal, Role of Java Programmer in Industry, Features of Java, Introduction to Java Development Kit (JDK), Java Runtime Environment & Java virtual machine (JVM), Java's Magic Byte code.

Module 2: **(08 Hrs)**

Object Oriented Programming: Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Constructor & initialization code block, Access Control, Modifiers, methods Nested, Inner Class & Anonymous Classes, Abstract Class & Interfaces Defining Methods, Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of "this "reference, Use of Modifiers with Classes & Methods, Design of Accessors and Mutator Methods.

Module 3: **(08 Hrs)**

Extending Classes and Inheritance: Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Overriding Super Class Methods, Use of "super", Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces. Package: Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages.

Module 4: **(08 Hrs)**

Exception Handling: Exceptions &Errors, Types of Exception, JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Un-Checked Exceptions. Thread: Understanding Threads, Thread Life-Cycle, Thread Priorities, Synchronizing Threads.

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.)
VII Semester

Module 5: **(08 Hrs)**

Event Handling: Event-Driven Programming in Java, Event- Handling Process, Event Handling Mechanism, Introduction to JDBC,JDBC Drivers & Architecture, Servlet API and Overview: Servlet Introduction, Servlet Life Cycle(SLC), Types and Servlet Configuration with Deployment Descriptor, Java Server Pages: Introduction to JSP , Comparison with Servlet, JSP Architecture, JSP: Life Cycle, Scripting Elements, Hibernate: Introduction to Hibernate, Exploring Architecture of Hibernate, Object Relation Mapping(ORM) with Hibernate, Hibernate Annotation, Hibernate Query Language (HQL).

Course Outcomes:

1. Describe the object-oriented programming concepts using JAVA.
2. Illustrate different types of classes and methods.
3. Apply fundamentals of inheritance and packages.
4. Understanding about exception handling and Threads.
5. Understanding about Event Handling, JDBC, Servlet and Hibernate.

List of Text / Reference Books:

1. Complete Reference J2EE by James Keogh mcgraw publication
2. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
3. Black Book “Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath”
4. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication

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.)
VII Semester

PEC CS03(A)	**Wireless and Mobile Computing**	**2L: 1T: 0P (3 hrs.)**	**3 credits**

Course Objective:

The objective of the Wireless and Mobile Computing course is to provide students with a fundamental understanding of wireless communication technologies and mobile computing systems. It covers wireless network architectures, mobility management, communication protocols, and standards like GSM, Wi-Fi, and Bluetooth. The course also introduces mobile application development and addresses key challenges such as security, power efficiency, and quality of service in mobile environments.

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Review of traditional networks: Review of LAN, MAN, WAN, Intranet, Internet, and interconnectivity devices: bridges, Routers etc. Review of TCP/IP Protocol Architecture: ARP/RARP, IP addressing, IP Datagram format and its Delivery, Routing table format, ICMP Messages, Subnetting, Supernetting and CIDR, DNS. NAT: Private addressing and NAT, SNAT, DNAT, NAT and firewalls, VLANS: Concepts, Comparison with Real LANS, Type of VLAN, Tagging, IPV6: address structure, address space and header.

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

Study of traditional routing and transport: Routing Protocols: BGP- Concept of hidden network and autonomous system, An Exterior gateway protocol, Different messages of BGP. Interior Gateway protocol: RIP, OSPF. Multiplexing and ports, TCP: Segment format, Sockets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control, Timeout and Retransmission algorithms, Connection Control, Silly window Syndrome. Example of TCP: Taho, Reno, Sack etc. UDP: Message Encapsulation, Format and Pseudo header.

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

Wireless LAN: Transmission Medium for WLANs, MAC problems, Hidden and Exposed terminals, Near and Far terminals, Infrastructure and Ad hoc Networks, IEEE 802.11- System arch, Protocol arch, Physical layer, Concept of spread spectrum, MAC and its management, Power management, Security. Mobile IP: unsuitability of Traditional IP; Goals, Terminology, Agent advertisement and discovery, Registration, Tunneling techniques. Ad hoc network

routing: Ad hoc Network routing v/s Traditional IP routing, types of routing protocols, Examples: OADV, DSDV, DSR, ZRP etc.

Module 4: **(6hrs.)**

Mobile transport layer: unsuitability of Traditional TCP; I-TCP, S-TCP, M-TCP. Wireless Cellular networks: Cellular system, Cellular networks v/s WLAN, GSM – Services, system architecture, Localization and calling, handover and Roaming.

Module 5: **(6hrs.)**

Mobile Device Operating Systems: Special Constraints & Requirements, Commercial Mobile Operating Systems. Software Development Kit: iOS, Android etc. MCommerce: Structure, Pros &Cons, Mobile Payment System, Security Issues.

Course Outcomes:

1. Design and create traditional networks.
2. Understand the different issues in MAC and routing issues in multi hop wireless and ad-hoc networks and existing solutions for the same.
3. Evaluate the transport layer issues in wireless networks due to error's and mobility of nodes and understand existing solutions for the same.
4. Explain the architecture of GSM.
5. Discuss the services, emerging issues and future trends in M-Commerce.

List of Text / Reference Books:

1. Comer, "Internetworking with TCP/ IP Vol-I", 5th edition, Addison Wesley, 2006.
2. Jochen Schiller "Mobile communication", 2nd edition, Pearson education, 2008.
3. W. Richard Stevens, "TCP/IP Illustrated Vol-I", Addison-Wesley.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education.
5. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer.
6. Android Developers: http://developer.android.com/index.html.
7. Apple Developer : https://developer.apple.com/
8. Windows Phone Dev Center: http://developer.windowsphone.com.
9. BlackBerry Developer: http://developer.blackberry.com/.

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.)
VII Semester

PEC- CS03(B)	Pattern Recognition	2L: 1T: 0P (3 hrs.)	3 credits

Course Objectives:

The objective of this course is to learn the fundamentals of pattern recognition and its relevance to classical and modern problems.

Course Contents: (40 hrs.)

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

Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classification and clustering, supervised Learning, unsupervised learning and adaptation, Pattern recognition approaches, Decision Boundaries, Decision region, Metric spaces, distances.

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

Classification: introduction, application of classification, types of classification, decision tree, naïve Bayes, logistic regression, support vector machine, random forest, K Nearest Neighbor Classifier and variants, Efficient algorithms for nearest neighbor classification, Different Approaches to Prototype Selection, Combination of Classifiers, Training set, test set, standardization and normalization.

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

Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square -error partitional clustering – K means, hierarchical clustering, Cluster validation.

Module 4: **(06 hrs.)**

Introduction of feature extraction and feature selection, types of feature extraction , Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (l, r) algorithm.

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.)
VII Semester

Module 5: **(06 hrs.)**

Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neurofuzzy techniques, and real-life examples, Histograms rules, Density Estimation, Nearest Neighbor Rule, Fuzzy classification.

Course Outcomes:

1. Understand the concept of a pattern and the basic approach to the development of pattern recognition.
2. Acquire the knowledge of classification, its types and normalization.
3. Understand unsupervised learning & clustering in pattern recognition.
4. Understand the basic methods of feature extraction, feature evaluation, and data mining.
5. Understand soft computing and fuzzy classification for recent advancements in pattern recognition.

List of Text / Reference Books:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C.M. Bishop, “PatternRecognitionandMachineLearning”, Springer, 2009.
3. S. Theodoridis and. Koutroumbas, “Pattern Recognition”, 4th Edition, academic Press, 2009.
4. Robert Schalk off, “pattern Recognition: statistical, structural and neural approaches”, JohnWiley&sons, Inc, 2007.

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.)
VII Semester

PEC CS03 (C)	**Digital Marketing and SEO**	**2L:1T:0P(3 hrs.)**	**3 credits**

Course Objectives:

Developing an overall understanding of digital marketing / online marketing platforms, mainly web analytics, social media tools, marketing through search engines, search engine optimization, mobile marketing, email marketing, Pay per click, digital display marketing, content marketing and Strategizing marketing.

Course Contents: (40 hrs.)

Module 1: (8hrs.)
Digital Marketing: Introduction, Moving from Traditional to Digital Marketing, Integrating Traditional and Digital Marketing, Reasons for Growth. Need for a comprehensive Digital Marketing Strategy. Concepts: Search Engine Optimization (SEO); Concept of Pay Per Click

Module 2: (8hrs.)
Social Media Marketing: Introduction, Process - Goals, Channels, Implementation, Analyze Tools: Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn, Issues: Credibility, Fake News, Paid Influencers, social media and Hate/ Phobic campaigns, Analytics and linkage with social media, The Social Community.

Module 3: (10hrs.)
Email Marketing: Introduction, email marketing process, design and content, delivery, discovery. Mobile Marketing: Introduction and concept, Process of mobile marketing: goals, setup, monitor, analyze; Enhancing Digital Experiences with Mobile Apps. Pros and Cons; Targeted advertising. Issues: Data Collection, Privacy, Data Mining, Money and Apps, Security, Spam. Growth Areas.

Module 4: (6hrs.)
Managing Digital Marketing: Content Production; Video based marketing; Credibility and Digital Marketing; IoT; User Experience; Future of Digital Marketing.

Module 5: (8hrs.)
SEO Analytics, Monitoring &Reporting: Google Search Console (GSC),Key Sections & Features of GSC; How to monitor SEO progress with Key Features of GSC: Overview, Performance, URL Inspection, Coverage, Sitemaps, Speed, Mobile Usability, Backlinks, Referring Domains, Security & Manual Actions, How to do SEO Reporting

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.)
VII Semester

Course Outcomes:

1. Understand the concept of digital marketing and its real-world iterations.
2. Articulate innovative insights of digital marketing enabling a competitive edge.
3. Understand how to create and run digital media-based campaigns.
4. Identify and utilize various tools such as social media etc.
5. Understand how to do SEO Audit.

List of Text / Reference Books:

1. Dodson, Ian: The Art of Digital Marketing- TheDefinitiveGuideto Creating Strategic, Targeted, and Measurable Online Campaigns. Wiley.
2. Ryan, Damien: Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.
3. Gupta, Sunil: Driving Digital Strategy. Harvard Business Review Press.
4. Tuten, Tracy L. and Solomon, Michael R.: Social Media Marketing. Sage.
5. Bhatia, Puneet S.: Fundamentals of Digital Marketing. Pearson.
6. Kotler, Philip: Marketing 4.0: Moving from Traditional to Digital. Wiley.

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.)
VII Semester

PEC CS03 (D)	Semantic Web and Ontologies	2L: 1T: 0P (3 hrs.)	3 credits

Course Objectives:

1. To learn Web Intelligence and Knowledge Representation for the Semantic Web
2. To learn Ontology Engineering
3. To learn Semantic Web Applications, Services and Technology
4. To understand the role of ontology and inference engines in semantic web

Course Contents: (40 hrs.)

Module 1: **(8hrs.)**

Semantic Web: Building Models,calculating with knowledge, Exchanging Information, Semantic Web Technologies, Types of Web: Smart Web & Dumb Web, Applications, SemanticData ,Search Engine for Semantic Web

Module 2: **(8hrs.)**

Semantic Modeling: Modeling for human communication, Explanation and prediction, Mediating Variability: Variation & Classes, Variation & Layers, and Expressivity in Modeling.

Module 3: **(8hrs.)**

Resource Description Language RDF:Introduction, Advanced features, simple ontologies in RDF Schema, encoding of special data structures, RDF formal semantics, syntactic reasoning with deduction rules, distributing data across web, Managing data from multiple sources.

Module 4: **(8hrs.)**

Web Ontology Language OWL: OWL syntax and Intuitive semantics, OWL species, Owl formal semantics: Description Logics, Model-Theoretic Semantics of OWL, And Automated reasoning with OWL, Ontology Matching and Distributed Information.

Module 5: **(8hrs.)**

Semantic Web Application Architecture: RDF Parser/Serializer, RDF store: RDF data standards and Interoperability of RDF stores, RDF query engines, SPARQL: Query language for RDF, conjunctive Queries for OWL DL, RDF backed web portals, Data federation. Ontology Engineering: Constructing Ontologies manually, Reusing Existing Ontologies, Semiautomatic Ontology Acquisition, Ontology Mapping

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.)
VII Semester

Course Outcomes:

1. Ability to understand and knowledge representation for the semantic web.
2. Ability to modeling and variability.
3. Design semantic web meta data and RDF schema.
4. Understand Electronic sources for network analysis and different Ontology languages.
5. Evaluate Web- based social network and Ontology.

List of Text / Reference Books:

1. Hitzler, Markus, Rudolph,"Foundations of Semantic Web Technologies", Chapman & Hall/CRC,2009,ISBN 9781420090505
2. Allemang ,Hendler ,"Semantic Web for the working Ontologist" 2nd ed. Elsevier Pub
3. Liang Yu ,"Introduction to the Semantic Web and Semantic Web Services", Chapman & Hall/CRC
4. Antoniou ,Harmelen , "A semantic Web Primer", PHI Pub.
5. Rajendra Akerkar ," Foundations of Semantic Web" , Narosa Publishing ,New Delhi

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.)
VII Semester

LC- CS14(P)	Data Science Lab	0L: 0T: 2P (2 hrs.)	1 credit

Course Objectives:

1. Provide hands-on experience in applying data science techniques using tools such as Python/R.
2. Enable students to preprocess data and perform exploratory data analysis.
3. Teach students how to implement data visualization techniques.
4. Help students understand and apply machine learning algorithms.
5. Develop problem-solving and analytical skills through real-world data sets

Module 1: **(5 hours)**

Introduction to Data Science – Overview of Data Science Life Cycle, Introduction to Python/R for Data Science, Data types, Libraries (NumPy, Pandas, Matplotlib).

Module 2: **(5 hours)**

Data Collection and Data Pre-Processing: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Module 3: **(5 hours)**

Exploratory Data Analytics: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Module 4: **(5 hours)**

Data Visualization techniques: Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

Module 5: **(5 hours)**

Model Development:Simple and Multiple Regression; Model Evaluation: Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

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.)
VII Semester

Course Outcomes:

1. Preprocess and analyze datasets using programming tools.
2. Apply statistical and visual techniques for data exploration.
3. Implement machine learning algorithms for classification and regression.
4. Interpret model results and evaluate performance metrics.
5. Work with real-time datasets and build mini-projects using end-to-end data science pipelines.

List of Experiments:

1. Introduction to R tool for data analytics science
2. Basic Statistics and Visualization in R
3. To clean a raw dataset by handling missing data, dealing with duplicates, and correcting errors in the dataset.
4. To integrate and transform multiple datasets to form a unified, consistent dataset ready for analysis or modeling.
5. Perform EDA on Credit Card Fraud Detection Dataset (open source dataset) for analyzing the data
6. Perform EDA on a sales dataset to identify trends, patterns, outliers, and relationships between variables like Customer Age, Annual Income, Purchase Amount, and Product Category
7. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.
8. Linear Regression
9. Logistic Regression
10. Plotting Accuracy and Error Metrics against number of iterations for evaluation of model performance.

List of Text / Reference Books:

1. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media.
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.
3. Anil Maheshwari, Data Science and Big Data Analytics, Wiley.
4. Wes McKinney, Python for Data Analysis, O'Reilly Media.
5. Rafael A. Irizarry, Introduction to Data Science, CRC Press.

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.)
VII Semester

PROJ- CS05	Project-II	0L: 0T: 8P (8hrs.)	4 credits

Course Objectives:

To carry out a medium/large-scale project to develop hands-on experience of working in a project. During the course, the student will also develop knowledge of application development platforms and tools (Java /C# dotnet / Visual C++/PHP /Python or any platform of current trend). The students will learn working as a team and basic collaboration and project management skills. The student will also learn about formulating project documentations.

1. Project ideas and proposal guidance (4 hours)

2. Application development (10 hours)

1. Visual programming (object oriented)
    1. Language basics
    2. Frameworks and APIs
2. Programming basics and design patterns

3. Project management, team work and collaboration (6 hours)

1. Project management techniques
2. Collaborative development environment

4. Project guidance & Project work (20 hours)

5. Project documentation guidance (3 hours)

Course Outcome:

1. Understanding the problem identification process and design a proposal for particular problem handling.
2. Design a solution model using any programming language.
3. Learn about different types of project management techniques.
4. Develop a complete project with deployment.
5. Learn about team work and documentation process.

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.)
VII Semester

PROJ- CS06	**Evaluation of Internship-II**	**0L: 0T: 6P (6hrs.)**	**3 credits**

Course Outcomes:

1. Explore career alternatives prior to graduation.
2. Develop communication, interpersonal and other critical skills in the job interview process.
3. Assess interests and abilities in their field of study.
4. Identify, write down, and carry out performance objectives related to their job assignment.
5. Integrate theory and practice.