SYLLABUS

DR VISHWANATH KARAD
MIT - WORLD PEACE UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

SCHOOL OF COMPUTER SCIENCE

B.SC. (Computer Science)

BATCH 2021-24

w.e.f. – 2021-22

Prof. Dr. Shubhalaxmi Joshi
BoS Chairperson & Associate Dean
Department of Computer Science & Application

Dr Dinesh Seth,
Dean - Engineering & Technology,
Div - I
MIT-WPU

Dr. Vishwanath Karad
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TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

PROGRAMME STRUCTURE

Preamble:

B. Sc. Computer Science is a three-year fulltime programme. It is based on semester pattern and choice based credit based system, it prepares the student for a future prospectus in IT Industry. The syllabus of computer Science subjects along with that of the three allied subjects (Mathematics, Electronics and Statistics) forms the required basics for pursuing higher studies in Computer Science

At first year a course in basic programming and a course in database fundamentals forms the preliminary skill set, helps to solve computational problems. One practical course in computer science subject per semester is designed including the programming and database fundamentals to supplement the theoretical training. Along with Computer Science courses basic science courses are also included i.e Electronics, Mathematics & Statistics theory and practical to help in building a strong foundation.

At second year programming skills are further strengthened by Object oriented programming and java programming. Website development skills are improved by courses like web development and Internet programming. Practical courses in computer science in each semester is designed including the Internet programming, Object oriented programming and Java programming. Operating system, Network security and Python course improve students in area other than programming. Along with Computer Science courses basic science courses are too included i.e Electronics and Mathematics theory and practical.

At third year latest technologies in computer science along with their practical's are offered. Students can chose the courses in computer science from the pool of Discipline Specific Elective courses which helps them to learn different skills. Practical in Mobile application development also enables students for developing mobile applications. Practical course also includes Mini project which gives students to explore need of different applications and solutions. Full time Industrial training (Internship) gives hands on experience in working on real application development.

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Chairperson

Vision and Mission of the Programme

Vision:

To contribute to the society through excellence in scientific and knowledge-based education utilizing the potential of computer science with a deep passion for wisdom, culture and values.

Mission:

- To create knowledge, to disseminate knowledge, and to provide service to our society
- Provide quality undergraduate and graduate education in both the theoretical and applied foundations of computer science
- Train students to effectively apply this education to solve real-world problems thus amplifying their potential for lifelong high-quality careers
- To give them a competitive advantage in the ever-changing and challenging global work environment.
- To achieve a distinguished position in Computer Science through innovative teaching learning methods and research.
- To develop strong fundamentals and habit of life-long learning in students to fulfill the needs of Industry

Programme Outcomes

PO1	Students will be able to Identify, formulate, and solve complex real time problems using of concepts of electronics, mathematics, Computer Sciences.
PO2	Students will be able to design software in order to plan and implement software systems using software engineering process.
PO3	Students will be able to develop, test and deploy Web based or Mobile based, Application using technology such as Java, PHP, Android or SQL.
PO4	Students are able to apply theoretical knowledge into practice. Lab courses and Internship helps them how apply theory to practice.
PO5	Students will be able to practice traditional Indian yoga which help them to improve creativity, concentration and also help to manage stress and imbibe human values.
PO6	Students will be prepared for a career in Computer Science as software developer or for higher studies in computer science or other fields.

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Programme Educational Objectives

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer-based solutions for real life problems.
- To imbibe quality software development practices. To create awareness about process and product standards
- To train students in latest professional skills.
- To prepare necessary knowledge base for research and development in Computer Science
- To help student's build-up a successful career in Computer Science.

Programme Specific Outcomes

- Full Time Industry Project – Internship gives hands on experience in solving a real-world problem.
- Students able to design dynamic website in the form of web programming.
- The Syllabus also develops requisite professional skills and problem-solving abilities for pursuing a career in Software Industry, Government, Banking and many other fields.
- B.Sc. (Computer Science) graduates can go for higher study in programmes like Master of Computer Application, M.Sc. in Computer Science, M.Sc. in Statistics, M.Sc. in Operation Research and M.Sc. in IT, M.Sc. in Data Science and Big Data and Analytics etc.

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Programme Structure:

(a) Programme duration: 3 Years Full Time

(b) System followed: Semester

(c) Credits System:

(i) Per Year

First Year – 39
Second Year – 41
Third Year – 40

(ii) Total in the programme – 120

(d) Assessment Criteria:

i. If student fail to score 4 CGPA but earned more than 50% of credits out of total number of credits for one course year, then he/she will be declared as a FAIL. But these FAIL students are Allow to Keep next Semester (ATKT) i.e. allowed to take admission in next academic year.

ii. The students with ATKT should improve the grade within subjects he/she failed or replace the subject (in case of elective only) with another subject to score required grades.

iii. If the student score less than 4 CGPA AND less than 50% of credits out of total number of credits are declared as a FAIL. These students are NOT allowed to take admission in next year unless they fulfil the condition A or B stated above.

iv. The student should pass all subjects in Semester 1 with at least 4 GPA for getting admission in Semester 7 (if applicable). Similarly, the student should clear all subjects in Semester 2 with at least 4 CGPA for getting admission in Semester 8 and so on.

(e) Medium of Instruction and Examination: English

(f) Eligibility criteria for admission to the programme:

1. **Maharashtra State (MS) Candidature**

i. Candidate should be an Indian Nationality.

ii. Passed 10+2 / 12th / HSC Examination in science stream with subject (OR) Three Years Engineering Diploma Recognized by Government Competent Authority (OR) Passed its equivalent examination with 50% Marks in

aggregate (45% in case of candidates of backward class categories and Persons with Disability belonging to Maharashtra State only).

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2. **Other Than Maharashtra (OMS) Candidature**

i. Candidate should be an Indian Nationality.

ii. Passed 10+2 / 12th / HSC Examination in science stream with Mathematics subject (OR) Three Years Engineering Diploma Recognized by Government Competent Authority (OR) passed its equivalent examination with 50% Marks in aggregate.

3. **Foreign Nation / NRI / OCI / PIO, Children of Indian workers in the Gulf countries**:

i. Passed 10+2/12th HSC Examination in science stream with Mathematics subject (OR) its equivalent examination in any stream with 50% marks in aggregate.

(h) Selection Process:

1. MIT-WPU UGPET Computer Science 2022- Online proctored Entrance exam – 100 marks
2. Personal Interview – 50 marks

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B.Sc. Computer Science w.e.f. 2022-23

A. Definition of Credit: -

3 Hr. Lecture / Tutorial per week	3 credits
2Hours Practical (Lab) per week	1 credit

B. Credits:-

Total number of credits for three-year undergraduate B.Sc. (CS) Programme would be 120.

C. Structure of Credits for Undergraduate B.Sc. Program: -

Sr. No.	Category	Suggested Breakup of Credits (Total 120)
1	Humanities and Social Sciences and Peace Programmes including Management courses	12
2	Basic Science courses including laboratory	24
3	Professional core courses including Laboratory/Mini Project Work	61
4	Professional Elective courses	08
5	AECC Courses	02
6	Full time Industrial Internship	12
7	MOOC	01
	Total	**120**

D. Course code and definition:-

Course code	Definitions
L	Lecture
T	Tutorial
WP	Humanities and Social Sciences and Peace
SEC	Skill Enhancement Courses
AECC	Ability Enhancement Compulsory Courses
MOOC	Massive Open Online Courses
OEC	Open Elective Courses
DEC	Discipline Specific Elective
BCS	B.Sc.(Computer Science)
MS	M.Sc.(Computer Science)

E. Grading Scheme:

Grades & Grade Points Marks Out of 100	Grade	Grade Point
80-100	O: Outstanding	10
70-79	A+: Excellent	9
60-69	A: Very Good	8
55-59	B+: Good	7
50-54	B: Above Average	6
45-49	C: Average	5
40-44	Pass	4
0-39	Fail	0
Ab	Absent	NA

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B. Sc. (Computer Science) (First Year) Batch(2021-24)

Trimester – I

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment, Marks			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Basic Programming using C	Core	3	-	-	2	-	50	-	50	100
2		Database Management System	Core	3	-	-	2	-	50	-	50	100
3		Fundamentals of Mathematics	Core	2	1	-	2	-	50	-	50	100
4		Introduction to Analog & Digital Electronics	Core	3	-	-	2	-	50	-	50	100
5		Lab on C & DBMS	Core	-	-	6	-	2	-	50	50	100
6		Lab on Analog & Digital Electronics	Core	-	-	3	-	1	-	25	25	50
7		World famous Philosophers, Saints/Sages and great Kings	SEC	3	-	-	2	-	70	-	30	100
		Total :	-	14	01	9	10	03	270	75	305	650

**Assessment Marks are valid only if Attendance criteria are met

Weekly Teaching Hours: 24

***CCA: Class Continuous Assessment**

Total Credits: First Year B.Sc. Computer Science Semester I: 13

***LCA: Laboratory Continuous Assessment**

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B. Sc. Computer Science (First Year) (w.e.f. 2022-23)

Trimester – II

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks **			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Advanced C Programming	Core	3	-	-	2	-	50	-	50	100
2		Relational Database Management System	Core	3	-	-	2	-	50	-	50	100
3		Fundamentals of Statistics	Core	2	1	-	2	-	50	-	50	100
4		Advanced Digital Electronics	Core	3	-	-	2	-	50	-	50	100
5		Lab on Advanced C & RDBMS	Core	-	-	6	-	2	-	50	50	50
6		Lab on Advanced Digital Electronics	Core	-	-	3	-	1	-	25	25	100
7		Communication Skill	AECC	3	-	-	2	-	50	-	50	100
		Total :	-	14	01	09	10	03	250	75	325	650

**Assessment Marks are valid only if Attendance criteria are met

Weekly Teaching Hours: 24

***CCA: Class Continuous Assessment**

Total Credits: First Year B.Sc. Computer Science Semester II: 13

***LCA: Laboratory Continuous Assessment**

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B. Sc. Computer Science (First Year) (w.e.f. 2022-23)

Trimester – III

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Object Oriented Programming using CPP	Core	3	-	-	2	-	50	-	50	100
2		Fundamental of Software Engineering	Core	3	-	-	2	-	50	-	50	100
3		Linear Algebra	Core	2	1	-	2	-	50	-	50	100
4		Microprocessor Family	Core	3	-	-	2	-	50	-	50	100
5		Lab on Data Structure using C	Core	-	-	6	-	2	-	50	50	100
6		Lab on Microprocessor	Core	-	-	3	-	1	-	25	25	50
7		Philosophy of Science and Religion / Spirituality	SEC	3	-	-	2	-	70	-	30	100
		Total :	-	14	01	9	10	03	270	75	305	650

**Assessment Marks are valid only if Attendance criteria are met

Weekly Teaching Hours: 24

Total Credits: First Year B.Sc. Computer Science Semester III: 13

Total First Year B.Sc. Computer Science Credits: 39

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B. Sc. Computer Science (Second Year) (Batch 2021-24)

Semester -III

**Assessment Marks are valid only if Attendance criteria are met

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Object Oriented Programming using CPP	Core	3	-	-	3	-	60	-	40	100
2		Web Development	Core	3	-	-	3	-	60	-	40	100
3		Object Oriented Software Engineering	Core	3	-	-	3	-	60	-	40	100
4		Graph Theory	Core	2	1	-	3	-	60	-	40	100
5		Microcontroller	Core	3	-	-	3	-	60	-	40	100
6		Lab on CPP & Web Development	Core	-	-	4	-	2	-	60	40	100
7		Lab on Microcontroller	Core	-	-	2	-	1	-	60	40	100
8		Environmental Science	SEC	2	1	-	3	-	60	-	40	100
		Total :	-	17	1	6	18	3	360	120	320	800

Weekly Teaching Hours: 24

Total Credits: Second Year B.Sc. Computer Science Semester IV: 21

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Semester – IV

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Operating System	Core	3	-	-	3	-	60	-	40	100
2		Core Java	Core	3	-	-	3	-	60	-	40	100
3		Internet Programming using PHP	Core	3	-	-	3	-	60	-	40	100
4		Discipline Specific Elective (DSE) – I	Elective	3	-	-	3	-	60	-	40	100
5		Data Communication & Networking	Core	3	-	-	3	-	60	-	40	100
6		Lab on Core JAVA & PHP	Core	-	-	4	-	2	-	60	40	100
7		Lab on Data Communication & Networking	Core	-	-	2	-	1	-	60	40	100
8		Philosophy of Science and Religion/Spirituality	SEC	3	-	-	2	-	90	-	60	100
		Total :	-	18	0	6	17	3	390	120	340	800

**Assessment Marks are valid only if Attendance criteria are met

Weekly Teaching Hours: 24

Total Credits: Second Year B.Sc. Computer Science Semester V: 20

Total Credit of Second Year B.Sc. Computer Science =41

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B. Sc. Computer Science (Third Year) (Batch 2020-23)

Semester – V

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Advanced Java	Core	3	-	-	3	-	60	-	40	100
2		Network Security	Core	3		-	3	-	60	-	40	100
3		Software Testing and Quality Assurance	Core	3			3	-	60	-	40	100
4		Open Elective	Elective	2			2		60		40	100
5		Discipline Specific Elective (DSE) – II	Elective	3	-	-	3	-	60	-	40	100
6		Lab on Advanced Java	Core	-	-	2	-	1	-	60	40	100
7		Lab on Python	Core	-	-	2	-	1	-	60	40	100
8		Indian Tradition, Culture and Heritage	SEC	3	-	-	2	-	90	-	60	100
		Total :	-	15	0	4	16	2	390	120	340	800

**Assessment Marks are valid only if Attendance criteria are met

Weekly Teaching Hours: 19

Total Credits: Second Year B.Sc. Computer Science Semester VI: 18

***** CCA: Class Continuous Assessment

***** LCA: Laboratory Continuous Assessment

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Semester – VI

**Assessment Marks are valid only if Attendance criteria are met

Sr. No.	Course Code	Name of Course	Type	Weekly Workload, Hrs			Credits		Assessment Marks**			
				Theory	Tutorial	Lab	Theory	Lab	CCA*	LCA*	End Term Test	Total
1		Theoretical Computer Science	Core	3	-	-	2	-	60	-	40	100
2		Introduction to Machine Learning	Core	3	-	-	2	-	60	-	40	100
3		Internet of Things	Core	3	-	-	2	-	60	-	40	100
4		Lab on ML	Core	-	-	3	-	1	-	60	40	100
5		Mini Project	SEC	3			2		90	-	60	100
6		Full time Industrial Internship	Core	-	-	40	-	12	-	60	40	100
7		MOOC	Core	-	-		1	-	100	-	-	100
		Total :	-	12	0	43	9	13	440	120	250	700

Weekly Teaching Hours: 55

Total Credits: Third Year B.Sc. Computer Science Semester VII: 22

Total Credit Third Year BSc Computer Science: 40

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*LCA: Laboratory Continuous Assessment

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B. Sc. Computer Science

Discipline Specific Elective:

Elective No.	Code	Title	Code	Title	Code	Title
DSE – I		Introduction to UNIX & Shell Scripting	BSC221B	PL/SQL		Computer Graphics
DSE – II		Information and Cyber Security	BSC305B	R Programming		Introduction to Digital Image Processing
DSE - III		Introduction to Cloud Computing	BSC312B	Introduction to Next Generation Databases		Introduction to Artificial Intelligence

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COURSE STRUCTURE

Course Code				
Course Category	**Core Computer Science**			
Course Title	**Advanced Java**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**		**--**	**3**

Pre-requisites:
1. Knowledge of C or C++ Programming Language
2. Knowledge of classes, objects, streams, Exception handling and file handling in Java.

Course Objectives:
Students will learn
1. Collection, different types of inheritance, interface
2. Graphics programming, Event Handling in Java
3. Multithreading Concept
4. To design User Interface using Swing and AWT
5. Introduction to MVC architecture
6. Web programming

Course Outcomes:
On completion of the course, student will be able to–
1. Students will learn Collection and multithreading concept.
2 Students will learn database programming using Java.
3.Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
4. Apply event handling on AWT and Swing components.
5. Students will get knowledge of MVC architecture.
6. Students will learn web programming using JSP and Servlet.

Course Contents:
1. Collection
2. JDBC
3. Multithreading

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4. AWT and SWING
5. JSP
6. Servlet

Learning Resources:

Reference Books:

1. Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer , Fourth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess

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1	**Collection:** Introduction to the Collection framework, List – ArrayList, LinkedList and Vector,Stack,Queue, Set - HashSet, TreeSet, and LinkedHashSet, Map – HashMap, LinkedHashMap, Hashtable and TreeMap, Interfaces such as Comparator, Iterator, ListIterator, Enumeration	7	-	-
2	**JDBC:** The design of JDBC, Basic JDBC program Concept, Drivers Architecture of JDBC, Making the Connection, Statement, ResultSet , PreparedStatement, CollableStatement, Executing SQL commands, Executing queries	7	-	-
3	**Multithreading:** What are threads? Life cycle of thread, Running and starting thread using Thread class, Thread priorities, Running multiple threads, The Runnable interface, Synchronization and interthread communication	6	-	-
4	**AWT & SWING :** **AWT:** What is AWT? Components and container used in AWT Layout managers, Event Handling: Event sources, Listeners, Mouse and Keyboard Event Handling, Adapters, Anonymous inner class. **SWING:** The MVC Architecture and Swing, Introduction to layout management, Text Fields, Labels, Check boxes, Radio buttons, List, Combo boxes, Border, Scrollbars, Scrolling window, Menus, Reacting to menu events, Icons in item menus, checkbox and radio button, menu items, Popup menu, Dialog boxes.	10	-	-
5	**JSP:** Simple first JSP program, Life cycle of JSP, Implicit Objects, Scripting elements – Declarations, Expressions, Scripless, Comments, JSP Directives – Page Directive, include directive, Mixing Scriplets and HTML, Example of forwarding contents from database to servlet, servlet to JSP and displaying it using JSP scrupled tag	6	-	-
6	**Servlet:** Introduction to Servlet and Hierarchy of Servlet, Life cycle of servlet, Tomcat configuration (Note: Only for Lab	9	-	-

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	Demonstration), Handing get and post request (HTTP)			

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COURSE STRUCTURE

Course Code	COS3104B			
Course Category	**Core Computer Science**			
Course Title	**Network Security**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**	**-**	**--**	**3**

Pre-requisites: A basic understanding of computer networks

Course Objectives:

- To develop a fundamental understanding of computer and network security proper practices, policies, technologies and standards
- To covers basic security topics, including symmetric and public key cryptography, digital signatures.
- To explain about User Authentication Mechanisms
- To explain IP and Web Security

Course Outcomes:

- Students will be able to explain concepts related to applied cryptography, including Plaintext, cipher text, symmetric cryptography, and asymmetric cryptography.
- Students should understand different User Authentication Mechanisms.
- Know underlying principles and techniques for IP and Web security

Course Contents:

Information Security Concepts

Cryptography and Secret Key Cryptography

Public key Cryptography

User Authentication Mechanisms

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Security Policies

Security At Different Levels

IP Security

Web Security

Learning Resources:

Reference Books:

1. 1. Cryptography and Network Security by Atul Kahate, 2nd Edition, Tata McGrawHill
2. Cryptography and Network Security by William Stallings, Fifth Edition, Pearson Education.
3. Cryptography: Theory and Practice by Douglas Stinson, CRC Press, CRC Press LLC
4. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech
5. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Supplementary Reading: Web Resources:

https://www.tutorialspoint.com/cryptography

Pedagogy:

Participative learning, problem solving, assignments, Tutorial

Assessment Scheme:

Class Continuous Assessment (CCA) 60 marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total

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BoS Chairperson & Associate Dean
Dept of Computer Science & Application

30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination : 40 marks

Syllabus:

Module	Contents	Work load in hrs.		
		Theory	Lab	Access
1	**Information Security Concepts** Information Security Overview: Background and Current, Scenario, Types of Attacks, Goals for Security, E-commerce Security, Computer Forensics, Steganography, Digital Signatures	5	-	-
2	**Cryptography and Secret Key Cryptography** Introduction to Cryptography / Encryption, Applications of Cryptography, Tools and techniques of Cryptography Block Encryption, DES rounds, S-Boxes IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES.	8	-	-
3	**Public key Cryptography** Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, Zero-knowledge signatures	8	-	-

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Ms. Sheetal Rajapurkar
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4	**User Authentication Mechanisms** Introduction, Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication, Biometric Authentication, Authentication with OAuth	8	-	-
5	**Security Policies** Concept of security policy, Policy design and standards i.e BS7799, ISO17799 & ISO27001, Why there is a need of these standards? Contents of ISO27001, Incident handling and escalation procedures, FW Implementation Practices, IP chain concepts.	8	-	-
6	**Security At Different Levels** Network Security: Electronic mail security, IP security, Network management, Security. Security for electronic commerce: TLS SET, System Security: Intruders and Viruses, Firewalls, Intrusion Detection	8	-	-

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Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

COURSE STRUCTURE

Course Code				
Course Category	**Core Computer Science**			
Course Title	**Software Testing and Quality Assurance**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**	**-**	**--**	**3**

Pre-requisites: Basics of Software Engineering concepts.

Course Objectives:

1. To introduce the basic concepts Quality Assurance and software Testing.
2. To understand the verification and validation.
3. To be familiar with a different types of testing techniques.
4. To understand how to write the test cases.

Course Outcomes:

After completion of the course, students will be able to:

1. Understand the quality assurance and quality control
2. Write the test cases.
3. Understand the different types of testing.

Course Contents:

1. Software Quality Assurance, Verification & Validation
2. Software Testing, Test Plan and Test Cases
3. Black Box and White Box Testing
4. Testing Types
5. Static & Dynamic Testing

Learning Resources:

Reference Books:

1. Software Testing by Ron Patton, TechMedia Pub.
2. Software Testing Techniques Boris Bezier, dreamTech pub,2nd Ed.
3. Effective Methods for software Testing William Perry, Wiley Pub,3rd Ed.

Web Resources:

1. www.effectivesoft.com

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2. www.sei.cmu.edu

Pedagogy:
Participative learning, discussions, assignments, Tutorials, experiential learning through practical problem solving, assignment, PowerPoint presentation, Case Studies

Assessment Scheme:

Class Continuous Assessment (CCA) 60 marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 marks

Syllabus

Module	Contents	Work load in hrs.		
		Theory	Lab	Access
1	**Software Quality Assurance and Quality Control:** Introduction to Quality, Quality Characteristics, QA, QC, SQA, Building Blocks of SQA, Verification & Validation Model, CMM, ISO	9	-	-

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2	**Introduction to Software Testing and Test plan:** Definition & Objectives, Types of software bugs, Bug life cycle, Testing lifecycle, Test Plan, Test Cases – Definition, Test Case Designing, Case Studies on Test Plan & Test Cases	12		
3	**Black Box and White Box Testing:** Functional Testing (Black Box) - Equivalence partitioning, BVA, Structural Testing (White Box) - Statement coverage, Branch & decision coverage, Path coverage, Domain Testing, Black box vs. White Box	8	-	-
4	**Testing Types:** Unit Testing, Integration Testing, System Testing – Performance, Load, Stress, Security, Recoverability, compatibility testing, Regression Testing, Installation Testing, Usability Testing, Acceptance Testing- Alpha testing & Beta testing, Static vs. Dynamic testing, Manual vs. Automatic testing.	10	-	-
5	**Static & Dynamic Testing:** Static Testing Techniques, Review types: Informal Review, Technical or peer review, Walkthrough and Review Meeting, Cyclometric Analysis, Case Study: Cyclometric Complexity	6	-	-

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COURSE STRUCTURE

Course Code	**COS 3114B**			
Course Category	**Core Computer Science**			
Course Title	**Lab on Advanced Java**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**-**	**-**	**2**	**1**

Pre-requisites:
1. Knowledge of C or C++ Programming Language
2. Knowledge of classes, objects, streams, Exception handling and file handling in Java.

Course Objectives:
Students will learn
1. Collection, different types of inheritance, interface
2. Graphics programming, Event Handling in Java
3. Multithreading Concept
4. To design User Interface using Swing and AWT
5. Introduction to MVC architecture
6. Web programming

Course Outcomes:
On completion of the course, student will be able to–
1. Students will learn Collection and multithreading concept.
2 Students will learn database programming using Java.
3.Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
4. Apply event handling on AWT and Swing components.
5. Students will get knowledge of MVC architecture.
6. Students will learn web programming using JSP and Servlet.

Course Contents:
1. Collection
2. JDBC
3. Multithreading

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4. AWT and SWING
5. JSP
6. Servlet

Learning Resources:

Reference Books:

1. Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer , Fourth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Laboratory Continuous Assessment (CCA): 50 Marks

Mid Term Lab Test (MCQ Online Test /Direct Internal Examination	Lab Performance	Lab Assignment / Lab Book	Total
30 Marks	20 Marks	10 Marks	60 Marks

Term End Examination : 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	To study Collection	-	05	-

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2	To study JDBC	-	05	-
3	To study Multithreading	-	05	-
4	To study AWT	-	05	-
5	To study SWING	-	05	-
6	To study JSP & JSP	-	05	-

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COURSE STRUCTURE

Course Code	**COS3115B**			
Course Category	**Core**			
Course Title	**Lab on Python**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**-**	**-**	**2**	**1**

Pre-requisites:

1. Experience with a high level language (C/C++, Java, MATLAB) is suggested.
2. Prior knowledge of a scripting language (Perl, UNIX/Linux shells) and Object-Oriented concepts is helpful but not mandatory.

Course Objective: -

Knowledge:	**To understand concepts with respect to** i) Design and Program Python applications ii) Define the structure and components of a Python program
Skills:	**Design skills of** i) Object-oriented programs with Python classes ii) Programming of Python applications
Attitude:	**To develop following** Confidence for logic building in Python

Course Outcomes:

1. Problem solving and programming capability.
2. Building and Packaging Python modules for reusability.
3. Designing object-oriented programs with Python classes.
4.

Course Contents:

1. Introduction To Python And Its Data Types
2. Python Programming Flow Control
3. Python Functions, Modules And Packages
4. String, List And Dictionary Manipulation And File Handling
5. Concept Of Oops
6. Exception Handling
7. Text Processing And Database Connectivity.

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Learning Resources:

Reference Book:

1. David M. Beazley, Python Essential Reference, Fourth Ed., Developers Library.
2. Python in a Nutshell by Alex Martelli (O'Reilly)
3. Learning Python by Mark Lutz and David Ascher (O'Reilly)

Websites :

1. https://www.codecademy.com/learn/learn-python
2. https://www.tutorialspoint.com/python
3. https://docs.python.org/3/tutorial/index.html

MOOCS:

1. https://www.mooc-list.com/tags/python

Pedagogy:

1. Participative learning, discussions, programming concepts, experiential learning through practical problem solving, assignments, Tutorial, conceptual and contextual learning

Assessment Scheme:

Laboratory Continuous Assessment (LCA) 60 Marks

Mid Term Lab Test (MCQ Online Test /Direct Internal Examination	Lab Performance	Lab Assignment / Lab Book	Total
30 Marks	20 Marks	10 Marks	60 Marks

Term End Examination : 40 Marks

Syllabus:

Module	Contents	Workload in Hrs

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No.		Theory	Lab	Assess
1	**Introduction to Python** What is Python and history of Python? Unique features of Python Python-2 and Python-3 differences Install Python and Environment Setup First Python Program Python Identifiers, Keywords and Indentation Comments and document interlude in Python Command line arguments Getting User Input Python Data Types What are variables? Python Core objects and Functions Number and Maths Week 1 Assignments	-	02	-
2	**Control Statements** if-else, if-elif-else while loop, for loop break, continue, assert, pass, return	-	02	-
3	**List, Ranges & Tuples in Python** Introduction Lists in Python Understanding Iterators Generators, Comprehensions and Lambda Expressions 1. Next and Ranges 2. Understanding and using Ranges Ordered Sets with tuples Python Dictionaries, Sets Python Sets Examples	-	08	-
4	**Python built in function** Python user defined functions Python packages functions Defining and calling Function The anonymous Functions Loops and statement in Python Python Modules & Packages	-	04	-

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5	**Python Object Oriented** Overview of OOP The self-variable Constructor Types Of Variables Namespaces Creating Classes and Objects Inheritance Types of Methods • Instance Methods • Static Methods • Class Methods. Decorator	-	06	-
6	**Files and Directories** a. Program to Writing Text Files, Appending Text to a File, Reading Text Files. b. Program to demonstrate Paths and Directories, File Information, Renaming, Moving, Copying, and Removing Files.	-	04	-
10	**Accessing Databases** a. Practical based on using DBM - Creating Persistent Dictionaries and Accessing Persistent Dictionaries. b. Practical based on using Relational Database - Writing SQL Statements, Defining Tables, Setting Up a Database. c. Practical based on using Using the Python Database APIs, Creating Connections, working with Transactions and Committing the Results.	-	04	-

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COURSE STRUCTURE

Course Code	COS3106B			
Course Category	**Core Computer Science**			
Course Title	**Data Analytics (Excel/Tableau)**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**2**		**--**	**2**

Pre-requisites:
1. No Earlier Analysis Knowledge required
2. Basics of Excel & spread sheets.
3. Desire to Learn and work with Data

Course Objectives:
On completion of the course, student will be able to :-
1. How to use Excel & Tableau for Data Analysis.
2. How to do Data analysis and Data Visualization.
3. How to use Excel for Data Cleaning, Preparation and finally Data Visualization
4. How to create a real interaction dashboard for projects in Tableau.
5. How to use Excel and Tableau to do your Data Analysis.

Course Outcomes:
On completion of the course, student will be able to :-
6. How to get started and get going with data analysis with learning how to use Excel & then use Tableau for Data analysis.
7. How to do Data analysis and data visualization.
8. How to use Excel and learn the various steps for doing data analysis viz data cleaning, preparation and finally data visualization
9. To create a real interaction dashboard for projects in Tableau.
10. Utilize Excel and Tableau to do your data analysis.

Course Contents:
1. Spread Sheet and Excel Part 1
2. Spread Sheet and Excel Part 2
3. Visualizing Our Data & Additional Features
4. Tableau Part 1 : Data Analysis and Data Cleaning and Preparation Steps
5. Data Visualisation
6. Dashboard
7. Sample Project

Learning Resources:

Reference Books:

1. Data Analytics Made Accessible, **A. Maheshwari**
2. Too Big to Ignore: The Business Case for Big Data, **P. Simon**
3. Business UnIntelligence: Insight and Innovation Beyond Analytics and Big Data, **B. Devlin**

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	**Spread Sheet and Excel Part 1:** 1. Basic and Excel spreadsheet & its Interface 2. Basics, Referencing and Autocompleting your Data 3. Formatting Your Data 4. Formatting the tables to make them more appealing 5. Using Conditional Formatting	3	-	-
2	**Spread Sheet and Excel Part 2:** 1. Filter/Sorting Our Data 2. Data Validation (Creating Drop down List), Formulas and Functions 3. Combining Data and Extracting Data from cells 4. Using IF Function 5. Vlookup Function and Data Cleaning 6. Excel: Using Checkbox, Slicer, and All other features	4		
3	**Visualizing Our Data & Additional Features:** 1. Pivot Tables 2. Creating Different Chart and Map Visualizations 3. Creating Pivot table and Charts in Excel 4. Creating Dashboard in Excel 5. Using Macros	5		
4	**Tableau Part 1 : Data Analysis and Data Cleaning and Preparation Steps** 1. What is Data Analysis & how to gather information? 2. What are the Dashboards & its types? 1. What is Blueprinting your Dashboards and how its done 2. Demonstration: Download the Tableau 3. How to Combine the Data in Tableau 6. Cleaning the Data 7. Preparation of the data	5		
5	**Data Visualisation** 1. How to create the first visualization 2. How to create the first map visual 3. Advanced Tableau features for creating Territories in Tableau 4. Using The Marks Card 5. How to create some filters	5		

6	**Dashboard** 1. TheDashboard Interface 2. How to Create Dashboard 3. How to use various Filters to make our dashboards more Interactive and Dynamic 4. How to download and Share your Dashboards	5		
7	**Sample Final Project** 1. Completing the first few tasks (Data cleaning, Preparation, and some charts) 2. Creating the Hollow pie Chart 3. Creating the Highlight Table 4. Creating the Map with Drilldowns	3		

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COURSE STRUCTURE

Course Code	COS3107B			
Course Category	**Core Computer Science**			
Course Title	**Data Mining**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**2**		**--**	**2**

Pre-requisites:
1. Understanding of Database concepts.
2. Understanding of different algorithms
3. Understanding of Data structures

Course Objectives:
On completion of the course, student will be able to: -
1. Identify the scope and necessity of Data Mining for the society
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. To understand various tools of Data Mining and their techniques to solve the real time problems.
4. To develop ability to design various algorithms based on data mining tools.
5. To develop further interest in research and design of new Data Mining techniques

Course Outcomes:
On completion of the course, student will be able to: -
1. Apply data mining techniques and methods to large data sets
2. Use data mining tools
3. Compare and contrast the various classifiers

Course Contents:
1. **Introduction**
2. **Data Warehousing**
3. **DW Implementation**
4. **Data Mining Algorithms**
5. **Web, Temporal and Spatial Data Mining:**

Learning Resources:

1. Jiawei I-lan & Micheline Kambler, "Data Mining: Concepts and Techniques", **Harcourt India Pvt. Ltd.,**
2. Margaret H. Dunham, "Data Mining : Introduction and Advance Topics", **Pearson Education, First Indian Reprint, 2003**
3. Arun K. Pujari, "Data Mining Techniques", **University Press (India) Limited, First edition,**

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Module No.	Contents	Work load in Hours		
		Theory	Lab	Assess
1	**Introduction:** 1. Data Mining – Motivation, 2. Importance of DM Functionalities, 3. Basic Data Mining Tasks, 4. DM Applications, and Social Implications	4	-	-
2	**Data Warehousing** 1. Differences between Operational Database and Data Warehouse 2. Multidimensional Data Model - From Tables to Data Cubes. 3. Schemas, Measures,	5		
3	**DW Implementation –** 1. Efficient Computation of Data Cubes. 2. Data Reprocessing, Data Mining Primitives, Languages 3. Data Cleaning, Data Integration and 4. Transformation, Data Reduction, 5. Discretization and concept of Hierarchy 6. Generation, Task relevant Data, Background Knowledge, Presentation and Visualization of Discovered Patterns**.**	7		
4	**Data Mining Algorithms** 1. Association Rule Mining, Classification and Prediction – 2. Decision Tree, 3. Bayesian Classification Back Propagation, 4. Cluster Analysis, Outlier Analysis**.**	8		
5	**Web, Temporal and Spatial Data Mining:** 1. Web Content Mining, 2. Web Structure Mining, 3. Web Usages Mining, 4. Spatial Mining, 5. Generalization and specialization,	6		

Prepared By	Checked By	Verified By	Approved By
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COURSE STRUCTURE

Course Code	COS3108B			
Course Category	**Core Computer Science**			
Course Title	**Digital Marketing**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**2**		**--**	**2**

Pre-requisites:
1. Should have good analytical ability and creativity
2. Good communication
3. Tech savviness

Course Objectives:
On completion of the course, student will be able to: -
1. To make student aware of digital marketing space
2. To make student understand digital marketing scope and limitations
3. To make student aware of digital marketing tools and techniques
4. To carry out digital marketing analytics

Course Outcomes:
On completion of the course, student will be able to: -
1. Will be able to use different strategies for marketing
2. Will be able to create brand marketing
3. A thought process to harness the power of Digital Marketing to improve the website or business
4. Will be able to analyse Digital Marketing tools

Course Contents:
1. **Introduction**
2. **Digital marketing vs. Traditional marketing**
3. **Website planning, search marketing, SEO**
4. **E-mail marketing, mobile marketing and affiliate marketing**
5. **Video marketing and blogging**

Learning Resources:

1. **Reference Books:**
   Digital Marketing by **Seema Gupta** (IIM-B)
2. Digital Marketing: Strategy, Implementation & Practice by **Dave Chaffey & Fiona EllisChadwick**
3. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation – **Damian Ryan and Calvin Jones**

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Module No.	Contents	Work load in Hours		
		Theory	Lab	Assess
1	**INTRODUCTION** 1. Meaning & Process of Marketing-Digital Marketing. 2. Visibility Meaning, Types. Visitors' Engagement- Meaning, importance & Examples. 3. Bringing Targeted Traffic- Inbound and outbound marketing. 4. Converting Traffic into Leads, Types of Conversion & Conversion Process tools. 5. Role of Digital Marketing in increase in sales, competitive analysis	6	-	-
2	**DIGITAL MARKETING VS. TRADITIONAL MARKETING** 1. Difference- Traditional marketing and Digital marketing. 2. Benefits and challenges. 3. Tools for effective Digital Marketing.	4		
3	**WEBSITE PLANNING, SEARCH ENGINE MARKETING, SEO** 1. Brand awareness, credibility and delivery among consumers through internet. 2. Understanding domain names & extensions. Different types of websites based on functionality, purpose planning &conceptualizing. 3. SEM in digital marketing - Need & Types. 4. Introduction to SEO-Benefits and Challenges. 5. Difference between SEO and SEM. 6. Paid search engine marketing, pay per click advertising (PPC); landing pages; 7. longtail concept; 8. geo-targeting e.g. Google Ad Words	6		
4	**E-MAIL MARKETING, MOBILE MARKETING and AFFILIATE MARKETING** 1. Email marketing Meaning, Basics, Types and benefits. 2. Mobile Marketing-Definition & Types. 3. Introduction to Affiliate Marketing- Need & Skills required.	4		
5	**VIDEO MARKETING and BLOGGING** 1. Introduction to Video Marketing, Types, Strategy, Need, Benefits and Challenges. 2. Blogs- Meaning, Importance, Issues and Challenges. 3. Digital Advertising Market in India 4. Case studies on digital marketing. (5 cases)	10		

Prepared By	Checked By	Verified By	Approved By
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COURSE STRUCTURE

Course Code	COS3109B			
Course Category	**Core Computer Science**			
Course Title	**Django Framework**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**2**		**--**	**2**

Pre-requisites:
1. Using Python for web development
2. Desire to Learn and work with Data
3. Must know basic components of Python like Basic syntax, decision making, loops, lists, tuples, and dictionaries.
4. The basics of procedural and object-oriented programming: control structures, data structures and variables, classes, objects, etc.

Course Objectives:
On completion of the course, student will be able to :-
1. How to use Django
2. How to design and implement python-based web app
3. How to use Django for rapid web development

Course Outcomes:
On completion of the course, student will be able to :-
1. Get started and get going with Django installation and setting work environment for web development
2. How to eliminate repetitive tasks making the development process an easy and time saving experience.
3. Students will be able to deploy web development framework that assists in building and maintaining quality web applications.

Course Contents:
1. Introduction to Django
2. Django Views & Models
3. Creating Administration Panel
4. Django Forms & Email
5.

Learning Resources:

Reference Books:

1. Building Websites with Django, **Awanish Ranjan, BPB Publication**
2. Learning Django Web Development, **Sanjeev Jaiswal, Ratan Kumar**
3. Django: Web Development with Python: Web Development with Python: Web Development with Python, **Arun Ravindran, Samuel Dauzon, Aidas Bendoraitis**

Pedagogy:

Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Syllabus

Module No.	Contents	Work load in Hours		
		Theory	Lab	Assess
1	**Introduction to Django:** 1. Django Overview 2. Django Installation 3. Creating a Project 4. Usage of Project in depth Discussion 5. Creating an application 6. Understanding Folder Structure Creating a Hello World Page	3	-	-
2	**Django Views & Models** 1. Django Views 2. Function Based Views 3. Class Based Views 4. URLconfs 5. URL namespaces 6. Other URLconfs 7. Django Templates 8. Template Tags and Filters 9. Template loading 10. Template Inheritance	6		
3	**Creating Administration Panel** 1. Using the admin interface 2. Customizing the admin interface 3. Adding users 4. Data access and modification using admin panel 5. Giving permissions to users	4		
4	**Django Forms and Email** 1. Django Forms 2. Getting Data from request object 3. Making a contact form 4. Customizing form design 5. Configuring email settings 6. Sending emails with Django	4		
5	**Sessions & cookies** 1. Difference between session and cookie 2. Creating sessions and cookies in Django 3. Configuring the session engine 4. Using session in views 5. Session Serialization 6. Setting Up the cache 7. The low-level cache API	4		

6	**Using Databases in Django** 1. Using SQLite 2. Configuring MySQL database 3. Working with MySQL in Django	3		
7	**Errors and Exception Handling** 1. Syntax errors 2. Exceptions 3. Using try/catch/else/finally 4. Handling multiple exceptions 5. Ignoring exceptions	3		
8	**Security** 1. Clickjacking protection 2. Cross Site Request Forgery protection 3. Cryptographic signing	3		

Prepared By	Checked By	Verified By	Approved By
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COURSE STRUCTURE

Course Code	COS3111B			
Course Category	**DSE-II**			
Course Title	**Information and Cyber Security**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	**3**	**-**	**-**	**3**

Pre-requisites:

Basic understanding of computer networks.

Course Objectives:

1. Knowledge

- To develop a fundamental understanding of information security at various levels.

2. Skills

- To understand basic concepts of information security.
- Ability to use existing security protocols and tools to build programs for secure communications.

3. Attitude

- To explore the working principles and utilities of algorithms including SET,SSL ,PGP,SMIME
- To elaborate the requirements of real-time communication security and issues related to the security of web services

Course Outcomes:

Students will learn to

1. Identify information security goals and current scenarios of information security
2. Understand basics of cryptography and various techniques of encryption
3. Understand various intrusion detection mechanisms to secure information
4. Understand implementation of web security protocols
5. Understand implementation of various email security protocols.

Course Contents:

1. Information Security Concepts
2. Introduction to cryptography
3. Access Control and Intrusion Detection
4. System Security
5. Server Management and Firewalls

Learning Resources:

Reference Books:

1. Cryptography and Network Security by Atul Kahate, 2nd Edition, Tata McGrawHill
2. Cryptography and Network Security by William Stallings, Fifth Edition, Pearson Education.
3. Principles of information security, Thomson, 2nd Edition,2005

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Pedagogy:
Participative learning, discussions, experiential learning through practical problem solving, assignments, Tutorial'

Assessment Scheme:
Class Continuous Assessment 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
20 Marks	15 Marks	15 Marks	60 Marks

Class Continuous Assessment (CCA) 40 marks

Syllabus:

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	**Information Security Concepts** Information Security Overview: Background and Current Scenario Types of Attacks Goals for Security E-commerce Security Computer Forensics Steganography	10	-	-
2	**Introduction to cryptography** Introduction to Cryptography / Encryption Digital Signatures Public Key infrastructure Applications of Cryptography Tools and techniques of Cryptography	10	-	-

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3	**Access Control and Intrusion Detection** Overview of Identification and Authorization Overview of IDS Intrusion Detection Systems and Intrusion Prevention Systems	8	-	-
4	**System Security** Desktop Security email security: PGP and SMIME Web Security: web authentication, SSL and SET	7		
5	**Firewalls** Overview of Firewalls Packet Filtering Firewall Stateful Inspection Firewall Application Layer Firewall Host- based Firewalls Network-based Firewalls firewall features Limitations of firewall	10	-	-

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COURSE STRUCTURE

Course Code	COS3110B			
Course Category	**Open Elective**			
Course Title	**Introduction to Blockchain**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**		**--**	**3**

Pre-requisites:

1. Basic knowledge of mathematical and algorithmic logics

Course Objectives:

On completion of the course, student will be able to :-

1. To understand the concepts of Blockchain.
2. To understand how to use blockchain technology in day-to-day for problem solving.
3. To develop the knowledge of Blockchain fundamental.

Course Outcomes:

On completion of the course, student will be able to :-

1. Understanding a fundamental of Blockchain Technology.
2. Understanding a concept of Blockchain Technology.
3. Understanding the types of Blockchain Technology.
4. Understanding application of Blockchain Technology
5. Understanding advantages & disadvantages of Blockchain Technology
6. Understanding Cryptocurrency

Course Contents:

1. Introduction to Blockchain
2. Blockchain Fundamentals
3. Types of Blockchain
4. Cryptocurrency
5. Bitcoin
6. Industry Application of Blockchain

Learning Resources:

Reference Books:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps by Daniel Drescher.
2. Blockchain fundamentals textbook Fundamentals of Blockchain by Ravindhar Vadapalli.
3. Blockchain Enabled Applications: Understand the Blockchain Ecosystem and How to Make it Work for You by Vikram Dhillon.

Pedagogy:
Participative learning, discussions, algorithm, flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:
Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1.	**Introduction to Blockchain:** 1. What is Blockchain? 2. How Blockchain Works 3. Advantages of Blockchain 4. Disadvantages of Blockchain 5. Blockchain Vocabulary	6	-	-
2	**Blockchain Fundamentals:** 1. Blockchain Security 2. Cryptographic Hash 3. SHA256 Demonstration 4. Distributed P2P Network 5. Promises of Blockchain	7		
3	**Types of Blockchain:** 1. Types of Blockchain – Private, Public and Consortium 2. Blockchain Security Management 3. P2P Systems	4		
4	**Cryptocurrency:** 1. Digital Signatures 2. Hashes 3. Cryptocurrency	4		
5	**Bitcoin:** 4. What is Bitcoin? 5. Bitcoin's monetary policy 6. How does Bitcoin Mining work? 7. Mining Demo	5		
6	**Industry Application of Blockchain:** 1. The Blockchain Industry Matrix 2. Healthcare 3. Finance 4. Internet 5. Real Estate	4		

	6. Retail 7. Data Storage 8. Government			

Prepared By	Checked By	Verified By	Approved By
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COURSE STRUCTURE

Course Code	**COS3113B**			
Course Category	**DSE-II**			
Course Title	**Introduction to Digital Image Processing**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**	**-**	**--**	**3**

Pre-requisites:

Most of the knowledge required should be part of the basics of Computer Science including Mathematics, Algorithms, and Programming.

Course Objectives:

1. To become familiar with digital image fundamentals
2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. To learn concepts of degradation function and restoration techniques.
4. To study the image segmentation and representation techniques.
5. To become familiar with image compression and recognition methods

Course Outcomes:

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

1. Discuss digital image fundamentals.
2. Apply image enhancement and restoration techniques.
3. Use image compression and segmentation Techniques.
4. Represent features of images.

Learning Resources:

Reference Books:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.

Pedagogy:

1. Participative learning, discussions, algorithm, programming concepts, experiential learning through practical problem solving, assignments, Tutorial

Assessment Scheme:

Class Continuous Assessment (CCA):60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

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Term End Examination : 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	**Introduction**: Digital image processing, Applications of digital image processing, Fundamental steps in digital image processing, and Components of an image processing system. Digital image fundamentals: Image sampling and quantization, some basic relationships between pixels, Linear and nonlinear operation	10	-	-
2	**Image enhancement and restoration** **Image enhancement in spatial domain:** Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering, smoothing spatial filters, Sharpening spatial filters. **Image enhancement in the frequency domain:** Introduction to the Fourier transform and the frequency domain, Smoothing frequency domain filters, Sharpening frequency domain filters, homomorphic filtering. **Image restoration:** A model of the image degradation/restoration process, Noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction by frequency domain filtering.	15	-	-
3	**Morphological image processing and image segmentation**: Preliminaries, Dilation and erosion, Opening and closing, the hit-or-miss transformation, Some basic morphological algorithms. **Image segmentation:** Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region-based segmentation, Segmentation by morphological watersheds	10		
	Representation, description and object detection : Representation, Boundary descriptors, Regional descriptors, Use of principal components for description, Relational descriptors**. Object recognition:** Patterns and pattern classes, Recognition based on decision- theoretic methods, Structural methods.	10		

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COURSE STRUCTURE

Course Code	**COS3112B**			
Course Category	**DSE-II**			
Course Title	**R Programming**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**		**--**	**3**

Pre-requisites:

Basic knowledge of any programming language

Course Objectives:

After completion of this course students will be able to:

1. Understand the basics of R programming.
2. Write functions, Install various packages and work effectively in the R environment
3. Become proficient in writing a fundamental programs

Course Outcomes:

After completion of this course students will be to -

1. Recognize and make appropriate use of different types of data structures
2. Identify and implement appropriate control structures to solve a particular programming problem
3. Understand and functions, packages, working with files, Data visualization and write programs in R

Course Contents:

1. Introduction to R
2. Basic Concepts of R
3. Data structures in R
4. Control flow
5. Functions
6. R packages
7. Working with files
8. R Data Reshaping & Data visualization

Pedagogy:

Participative learning, discussions, algorithm, programming concepts, experiential learning through practical problem solving, assignments, Tutorial, Mini Project

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Assessment Scheme:

Class Continuous Assessment (CCA): 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination : 40 Marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	**Introduction to R:** Overview of R programming, Evolution of R, Applications of R programming, Basic syntax	3	-	-
2	**Basic Concepts of R:** Reserved Words, Variables & Constants , Operators, Operator Precedence, Data Types , Input and Output	5	-	-
3	**Data structures in R:** Vectors, Matrix, List in R programming, Data Frame, Factor	6	-	-
4	**Control flow:** If...else, If else() Function, Programming for loop While Loop, Break & next, Repeat Loop	5	-	-
5	**Functions:** R Functions, Function Return Value, Environment & Scope, R Recursive Function, R Infix Operator, R Switch	6	-	-
6	**R packages:** Study of different packages in R(with respect to string, date-time, etc)	6	-	-
7	**Working with files:** Read and writing into different types of files	5	-	-
8	**R Data Reshaping & Data visualization:** Joining Columns and Rows in a Data Frame, Merging Data Frames, Melting and	9		

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	Casting, Plotting with Base, Lattice Graphics & ggplot, Bar Chart, Dot Plot, Scatter Plot (3D), Spinning Scatter Plots, Pie Chart, Histogram (3D) [including colorful ones], Boxplot			

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COURSE STRUCTURE

Course Code	**COS3117B**			
Course Category	**Core**			
Course Title	**Introduction to Machine Learning**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**3**		**--**	**2**

Pre-requisites:

Basic knowledge of Linear algebra, probability and Statistics

Course Objectives:

1. Understanding various learning strategies
2. Mathematical representation of Machine learning problems and solutions

Course Outcomes:

Students will learn to

1. Use Machine learning using linear methods and non linear methods
2. Develop an appreciation for what is involved in learning models from data.
3. Understand a wide variety of learning algorithms.
4. Understand how to evaluate models generated from data.
5. Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Course Contents:

1. Introduction to Learning
2. Linear Regression
3. Classification
4. Neural Networks and Decision Tree
5. Unsupervised Learning
6. Support Vector Machines

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Learning Resources:

Reference Books:

1. Introduction to Machine Learning (Second Edition): Ethem Alpaydın, The MIT Press (2010).
2. Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006)
3. Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press (2012)
4. Machine Learning, Tom Mitchell

Web Resources:

1. https://towardsdatascience.com/
2. https://github.com/josephmisiti/awesome-machine-learning.

Pedagogy:

Participative learning, discussions, experiential learning through practical problem solving, assignments, numerical solving, Tutorial.

Assessment Scheme:

Class Continuous Assessment (CCA): 60 marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination : 40 marks

Syllabus

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess
1	**Introduction to Learning :** Why Machine learning, Examples of Machine Learning, Problems, Structure of Learning. Supervised, Unsupervised and Reinforcement Learning.	3	-	-

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2	**Linear regression**: SSE; gradient descent; Simple Linear Regression, multiple linear regression Overfitting and underfitting; bias and variance, training, validation, test data	5	-	-
3	**Classification** : decision boundaries; nearest neighbor methods Probability and classification Linear classifiers: Bayes' Rule and Naive Bayes Model Logistic regression decision boundary (linear and non-linear), metrics for logistic regression (accuracy, sensitivity, specificity etcetera concepts), Receiver- operating characteristic (RoC) curve, use of RoC curve to find out optimum decision boundary	10	-	-
4	**Neural Networks & Decision tree:** Concept of neural networks, perceptron, decision tree, random forest	7	-	-
5	**Unsupervised learning:** clustering, k-means, hierarchical agglomeration, Dunn's index	2	-	-
6	**Support vector machines:** Concept of margin, support vectors and large-margin classifiers, kernel tricks	3		

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COURSE STR UCTURE

Course Code				
Course Category	**CORE**			
Course Title	Internet of Things			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	**3**			**2**

Pre-requisites:

1. Knowledge of networking, sensing, databases, programming, and related technology.
2. Familiarity with business concepts and marketing.

Course Objectives:

1. Vision and Introduction to IoT.
2. Understand IoT Market perspective.
3. Data and Knowledge Management and use of Devices in IoT Technology.
4. Understand State of the Art – IoT Architecture.
5. Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes:

On completion of the course, student will be able to–

1. Students will understand IoT Market perspective.
2. Students will get Data and Knowledge Management and use of Devices in IoT Technology.
3. Students will understand State of the Art – IoT Architecture.
4. Students will get Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Contents:

M2M to IoT
M2M to IoT – A Market Perspective
M2M and IoT Technology Fundamentals
IoT Architecture-State of the Art
IoT Reference Architecture

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Learning Resources:

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.Data Warehousing in the Real World, Anahory, Murray, Pearson Education
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

Supplementary Reading:

1. Collaborative Internet of Things (C-IoT): For Future Smart Connected Life and Business
2. By Fawzi Behmann, Kwok Wu

Weblinks:

www.tutorialspoint.com

Pedagogy:

Participative learning, discussions, Problem Solving, experiential learning through practical problem solving, assignment, PowerPoint presentation

Assessment Scheme:

Class Continuous Assessment (CCA) 60 Marks

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Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination: 40 Marks

Syllabus:

Module No.	Contents	Workload in Hrs		
		Theory	*Lab*	*Assess*
1	**M2M to IoT** The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics	4		
2	**M2M to IoT – A Market Perspective** Introduction, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations	4		
3	**M2M and IoT Technology Fundamentals** Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	7		
4	**IoT Architecture-State of the Art**	7		

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	Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, CICSO Reference Model			
5	**IoT Reference Architecture** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration,	8		

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Sign
(< Name >
<(Dean / Director / Principal)>

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COURSE STR UCTURE

Course Code				
Course Category	*B.Sc. Computer Science*			
Course Title	Theoretical Computer Science			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs	**3**			**2**

Pre-requisites:

1. Basic understanding of mathematical concepts

Course Objectives:

1. To understand concept of Regular languages and Finite Automata
2. To understand concepts of Context free languages and Pushdown Automata
3. To understand concepts of Turing Machine

Course Outcomes:

On completion of the course, student will be able to– functioning, capabilities, computability, complexity as well as the limitations of different mathematical models

Course Contents:

Introduction
Symbol, Alphabet, String, Prefix & Suffix of Strings
Regular Expression, Regular Language and Finite Automata
Regular expression: Definition & Example, Regular Expressions Identities.
Context Free Grammar and Languages
Grammar-Definition and Examples, Derivation, Reduction, Definition and Examples.
Push Down Automaton
Definition of PDA and examples, Construction of PDA using empty stack and final State method
Turing Machine
Model and Definition of TM, Design of Turing Machines

Learning Resources:

Prepared By	Checked and Verified By	Approved By
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Reference Books:

1. Introduction to Automata theory, Languages and computation By John E. Hopcroft and Jeffrey Ullman –Narosa Publishing House.
2. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition
3. Introduction to Automata theory, Languages and computation By John Hopcroft, Rajeev Motwani and Jeffrey Ullman –Third edition Pearson Education

Pedagogy:

Participative learning, discussions, algorithm, Flowchart & Program writing, experiential learning through practical problem solving, assignment, PowerPoint presentation.

Assessment Scheme:

Class Continuous Assessment (CCA) 60 Marks

Mid Term Examination (MCQ Online Test /Direct Internal Examination	FAT 1 (Formative Assessment Test 1)	FAT 2 (Formative Assessment Test 1)	Total
30 Marks	15 Marks	15 Marks	60 Marks

Term End Examination : 40 Marks

Syllabus:

Module No.	Contents	Workload in Hrs		
		Theory	Lab	Assess

Prepared By	Checked and Verified By	Approved By
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1	**Unit 1: Introduction** Symbol, Alphabet, String, Prefix & Suffix of Strings, Formal Language, Operations on Languages.	1	-	-
2	**Unit 2: Regular Expression, Regular Language and Finite Automata** Regular expression: Definition & Example Regular Expressions Identities. Finite Automata Deterministic finite Automaton -Definition, DFA as language recognizer, DFA as a pattern recognizer. Nondeterministic finite automaton- Definition and Examples. NFA TO DFA NFA with ε-transitions- Definition and Examples. NFA with ε-Transitions to DFA & Examples Finite automaton with output-Mealy and Moore machine, Definition and Examples Minimization of DFA-Algorithm & Problem using Table Method. Regular Languages-Definition and Examples. Conversion of RE To FA-Examples. Pumping lemma for regular languages and applications. Closure properties of regular Languages (Union, Concatenation, Complement, Intersection and Kleene closure)	9	-	-
3	**Unit 3: Context Free Grammar and Languages** Grammar-Definition and Examples Derivation, Reduction, Definition and Examples. Chomsky Hierarchy. CFG- Definition & Examples. LMD, RMD, ,Parse Tree Ambiguous Grammar- Concept & Examples. Simplification of CFG : Removing Useless Symbols, Removing unit productions	8	-	-

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Ms Gauri Dhongade Teaching Associate Dept of Computer Science & Application	Ms Sheetal Rajapurkar Dept of Computer Science & Application	Prof. Dr. Shubhalaxmi Joshi BoS Chairperson & Associate Dean Dept of Computer Science & Application

	Removing ϵ productions & Nullable symbols Normal Forms: Chomsky Normal Form (CNF) Method & Problem Greibach Normal form (GNF) Method & Problem Regular Grammar: Definition Left linear and Right Linear Grammar-Definition and Example. Equivalence of FA & Regular Grammar Construction of regular grammar equivalent to a given DFA Construction of a FA from the given right linear grammar Closure Properties of CFL's (Union, concatenation and Kleen closure) Method and examples			
4	**Unit 4: Push Down Automaton** Definition of PDA and examples Construction of PDA using empty stack and final State method : Examples using stack method Definition DPDA & NPDA Examples of DPDA & NPDA CFG (in GNF) to PDA : Method and examples	6	-	-
5	**Unit 5: Turing Machine** Model and Definition of TM Design of Turing Machines Problems on language recognizers. Language accepted by TM Types of Turing Machines Introduction to LBA (Basic Model) & CSG(Without Problems) Recursive Languages and Recursively enumerable Languages. Turing Machine Limitations	6	-	-

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Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

COURSE STRUCTURE

Course Code				
Course Category	**Core Computer Science**			
Course Title	**Lab on ML**			
Teaching Scheme and Credits	**L**	**T**	**Laboratory**	**Credits**
Weekly load hrs.	**-**	**-**	**3**	**1**

Pre-requisites:

1. Knowledge of Python
2. Desirable: Knowledge of Jupyter Notebook, Scikit-Learn

CourseObjectives:

1. To implement Machine Learning algorithms in Python.
2. To use the algorithm to solve real life problems

Course Outcomes:

Student will be able to

1. Construct and implement Python codes for Machine learning algorithms.
2. Implement the Python codes on real life data.
3. Analyze and improve the performance of the Python codes for better solutions.

Course Contents:

1. Linear Regression
2. Classification
3. Neural Networks and Decision Tree
4. Unsupervised Learning
5. Support Vector Machines

Learning Resources:

Reference Books:

1. Introduction to Machine Learning with Python, Andreas C. Müller & Sarah Guido, O'reilly.
2. Hands-on Machine Learning with Scikit-Learn & TensorFlow, Aurélien Géron, O'reilly.
3.

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Data Resources:

1. https://www.kaggle.com/
2. https://github.com/

Weblinks:

1. https://www.tutorialspoint.com/android/index.htm
2. https://www.javatpoint.com/android-tutorial
3. https://www.tutorialspoint.com/ios/index.htm
4. https://www.raywenderlich.com/ios

Pedagogy:

1. Practical development of Python codes for Machine Learning algorithms
2. Analyzing and improving the performance of the Python codes using Scikit-Learn.
3. Implementing on real life data.
4. Participative learning, discussions, algorithm, programming concepts, experiential learning through practical problem solving, assignments, Tutorial

Assessment Scheme: (LCA & END TERM):

Laboratory Continuous Assessment (LCA): 60 marks

Mid Term Lab Test (MCQ Online Test /Direct Internal Examination	Lab Performance	Lab Assignment / Lab Book	Total
30 Marks	20 Marks	10 Marks	60 Marks

Term End Examination: 40 marks

Syllabus:

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Module	Lab Work	No. of Labs
1	Practice visualization using matplotlib, seaborn. Implement simple linear regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Boston, Auto etc]	02
2	Implement multiple regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Carseats, Boston etc].	02
3	Fit a classification model using following: (i) logistic regression (ii) k-nearest neighbour (iii) Naïve Bayes (iv) Decision tree (v) Perceptron on a standard data set and compares the results based on standard metrics. [Inbuilt datasets like Smarket, Weekly, Auto, Boston etc may be used for the purpose].	10
4	Implement clustering with the following: (i) K-means (ii) Hierarchical clustering On a standard data set like Iris, etc.	10
5	Implement SVM on a standard data set by selecting different kernels like RBF, Linear, Polynomial. Comment on result based on standard metrics.	06

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