

UNIVERSITY OF MUMBAI

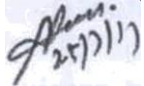
No. UG/ J>Tif 2017

CIRCULAR:-

A reference is **invited** to the Syllabi relating to the B.Sc. degree course, vide this office Circular No. UG/42 of 2016-17, dated 5th August , 2016 and the Principals of the affiliated Colleges in Science are hereby informed that the recommendation made by Ad-hoc-Board of Studies Ln Computer Science at its meeting held on **5/5/2017** has been accepted by the Academic Council at its meeting held on 11.5.2017 vide item No. 4.210 and that in accordance therewith, in revised syllabus as per the Credit Based Semester and Grading System for S.Y.B.Sc Computer Science (Sem III & IV) which is available on the University's website (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

MUMBAI — 400 032

July, 2017


REGISTRAR

To,

The Principal of the affiliated Colleges in Science and the Head of Recognized Institutions concerned.

A.C/4.210/11.05.2017

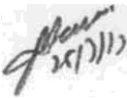
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२३th July, 2017

Copy forwarded with compliments for inTorr•.a.tion to

- 1) The Co-ordinator, Faculty of Science.,
- 2) The Offg. Director of Board of Examinations and Evaluation,
- 3) The Chairperson, Board of Studies in Botar.y,
- 4) The Director of Board of Studies Development.
- 5) The Professor-cum-Director, Ir.stitute of Distance and Open Leamlng.
- 6) The Co-Ordinator, University Cen.puierization Centre.



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UNIVERSITY OF MUMBAI



**Syllabus for SemIV
Program: B.Sc.
Course: Computer Science**

(Credit Based Semester and Grading System with
effect from the academic year 2017-2018)

Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the current industry needs in terms of skills sets demanded under new technological environment. It also endeavours to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry affable and suitable to cater the needs of society and nation in present day context.

Second year of this course is about studying core computer science subjects. Theory of Computation course provides understanding of grammar, syntax and other elements of modern language designs. It also covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The course in Operating System satisfies the need of understanding the structure and functioning of system. Programming holds key indispensable position in any curriculum of Computer Science. It is essential for the learners to know how to use object oriented paradigms. There is also one dedicated course Android Developer Fundamentals as a skill enhancement catering to modern day needs of Mobile platforms and applications. The syllabus has Database Systems courses in previous semesters. The course in Database Management Systems is its continuation in third semester. The course has objectives to develop understanding of concepts and techniques for data management along with covers concepts of database at advance level.

The course of Combinatorics and Graph Theory in third semester and the course of Linear Algebra in fourth semester take the previous courses in Mathematics. Graph theory is rapidly moving into the mainstream mainly because of its applications in diverse fields which include can further open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.

Introducing one of the upcoming concepts Physical Computing and IoT programming will definitely open future area as Embedded Engineer, involvement in IoT projects, Robotics and many more. The RasPi is a popular platform as it offers a complete Linux server in a tiny platform for a very low cost and custom-built hardware with minimum complex hardware builds which is easier for projects in education domain.

S.Y.B.Sc. (Semester III and IV)
Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2017-2018

SEMESTER III			
Course	TOPICS	Credits	L / Week
USCS301	Theory of Computation	2	3
USCS302	Core JAVA	2	3
USCS303	Operating System	2	3
USCS304	Database Management Systems	2	3
USCS305	Combinatorics and Graph Theory	2	3
USCS306	Physical Computing and IoT Programming	2	3
USCS307	Skill Enhancement: Web Programming	2	3
USCSP301	USCS302+USCS303+USCS304	3	9
USCSP302	USCS305+USCS306+USCS307	3	9

SEMESTER IV			
Course	TOPICS	Credits	L / Week
USCS401	Fundamentals of Algorithms	2	3
USCS402	Advanced JAVA	2	3
USCS403	Computer Networks	2	3
USCS404	Software Engineering	2	3
USCS405	Linear Algebra using Python	2	3
USCS406	.NET Technologies	2	3
USCS407	Skill Enhancement: Android Developer Fundamentals	2	3
USCSP401	USCS401+ USCS402+ USCS403	3	9
USCSP402	USCS405+ USCS406+ USCS407	3	9

SEMESTER IV

THEORY

Course: USCS401	TOPICS (Credits : 02 Lectures/Week:03) Fundamentals of Algorithms	
Objectives: <ol style="list-style-type: none">1. To understand basic principles of algorithm design and why algorithm analysis is important2. To understand how to implement algorithms in Python3. To understand how to transform new problems into algorithmic problems with efficient solutions4. To understand algorithm design techniques for solving different problems Expected Learning Outcomes: <ol style="list-style-type: none">1. Understand the concepts of algorithms for designing good program2. Implement algorithms using Python		
Unit I	Introduction to algorithm, Why to analysis algorithm, Running time analysis, How to Compare Algorithms, Rate of Growth, Commonly Used Rates of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega- Ω Notation, Theta- Θ Notation, Asymptotic Analysis, Properties of Notations, Commonly used Logarithms and Summations, Performance characteristics of algorithms, Master Theorem for Divide and Conquer, Divide and Conquer Master Theorem: Problems & Solutions, Master Theorem for Subtract and Conquer Recurrences, Method of Guessing and Confirming	15L
Unit II	Tree algorithms: What is a Tree? Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals, Expression Trees, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL (Adelson-Velskii and Landis) Trees Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree	15L

	Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order	
Unit III	<p>Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method</p> <p>Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique</p> <p>Divide and Conquer Algorithms: Introduction, What is Divide and Conquer Strategy? Divide and Conquer Visualization, Understanding Divide and Conquer, Advantages of Divide and Conquer, Disadvantages of Divide and Conquer, Master Theorem, Divide and Conquer Applications</p> <p>Dynamic Programming: Introduction, What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy, Problems which can be solved using Dynamic Programming, Dynamic Programming Approaches, Examples of Dynamic Programming Algorithms, Understanding Dynamic Programming, Longest Common Subsequence</p>	15L
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1. Data Structure and Algorithmic Thinking with Python, Narasimha Karumanchi , CareerMonk Publications, 2016 2. Introduction to Algorithm, Thomas H Cormen, PHI <p>Additional References(s):</p> <ol style="list-style-type: none"> 1. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 2016, Wiley 2. Fundamentals of Computer Algorithms, Sartaj Sahni and Sanguthevar Rajasekaran Ellis Horowitz, Universities Press 		

Suggested List of Practical – SEMESTER IV

Course: USCSP401	(Credits : 03 Lectures/Week:09) USCS401+ USCS402+USCS403	
USCS401: Fundamentals of Algorithms		
<ol style="list-style-type: none">1. Write Python program to perform matrix multiplication. Discuss the complexity of algorithm used.2. Write Python program to sort n names using Quick sort algorithm. Discuss the complexity of algorithm used.3. Write Python program to sort n numbers using Merge sort algorithm. Discuss the complexity of algorithm used.4. Write Python program for inserting an element into binary tree.5. Write Python program for deleting an element (assuming data is given) from binary tree.6. Write Python program for checking whether a given graph G has simple path from source s to destination d. Assume the graph G is represented using adjacent matrix.7. Write Python program for finding the smallest and largest elements in an array A of size n using Selection algorithm. Discuss Time complexity.8. Write Python program for finding the second largest element in an array A of size n using Tournament Method. Discuss Time complexity.9. Write Python program for implementing Huffman Coding Algorithm. Discuss the complexity of algorithm.10. Write Python program for implementing Strassen's Matrix multiplication using Divide and Conquer method. Discuss the complexity of algorithm.		

Evaluation Scheme

I. Internal Exam - 25 Marks

(i) Test – 20 Marks

20 marks Test – Duration 40 mins

It will be conducted either using any open source learning management system like Moodle (Modular object-oriented dynamic learning environment)

OR

A test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform.

(ii) 5 Marks – Active participation in routine class instructional deliveries

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

II. External Exam– 75 Marks

III. Practical Exam – 50 Marks

- Each course carry 50 Marks : 40 marks + 05 marks (journal) + 05 marks (viva)
- Minimum 75 % practical from each paper are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)
