Department of Computer Applications
National Institute of Technology-Tiruchirappalli

COURSE PLAN – PART I			
Name of the programme and specialization	**MSc- COMPUTER SCIENCE**		
Course Title	**DATA STRUCTURES AND ALGORITHMS**		
Course Code	**CAS 765**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**July 2019**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. C. Sivaraj**	**Department**	**Computer Applications**
E-mail	**sivaraj@nitt.edu**	**Telephone No.**	**7339431431**
Name of Course Coordinator(s) (if, applicable)	**Dr. Michael Arock**		
E-mail	**michael@nitt.edu**	**Telephone No.**	
Course Type	**Core course**		

Syllabus (approved in BoS)

Introduction – Arrays – Structures – Stack: Definition and examples, Representing Stacks - Queues and lists: Queue and its Representation, lists – Applications of Stack, Queue and Linked Lists-Basics of Programming and Data Structures.

Binary Trees – Binary Tree Representations – node representation, internal and external nodes, implicit array representation - Operations on binary trees – Binary tree Traversals - Representing Lists as Binary Trees–Search Trees.

Algorithms – Analyzing and Designing algorithms – Asymptotic notations – Recurrences – Methods to solve recurrences – Basic sorting techniques – selection sort, bubble sort, insertion sort and merge sort – Basic Search Techniques – linear search and binary search.

Revisiting various operations of different data structures with time complexity analysis – Design and Analysis of Heap Sort - Quick Sort – Sorting in linear time – Radix sort – Selection in linear time.

Design Strategies: Recursion - Divide and conquer methodology – Multiplication of large integers – Strassen's matrix multiplication – Greedy method – Prim's algorithm – Kruskal's algorithm – algorithm for Huffman codes – Dynamic Programming – Backtracking and Branch and bound method

ESSENTIAL READINGS : Textbooks, reference books, etc

1. *Stephen Prata,"C++ Primer Plus", 6th Edition ,Addison-Wesley Professional, 2011.*
2. *Bjarne Stroustrup, "Programming: Principles and Practice Using C++,1st Edition, Addison-Wesley Professional, 2008*
3. *Bruce Eckel ,"Thinking in C++: Introduction to Standard C++: Volume One" 2nd Edition,PrenticeHall, 2000*
4. *T.H.Cormen, C.E.Leiserson, R.L.Rivest and C. Stein, "Introduction to algorithms", 3rd edition, 2009, MIT Press.*
5. *P. H. Dave and H. B.Dave, "Design and Analysis of Algorithms", 2009, Pearson Education India.*
6. *S. Lipschutz and G.A.V. Pai, "Data Structures", 2010, Tata McGraw-Hill.*
7. *Clifford A. Shaffer, "Practical Introduction to Data Structures and Algorithm Analysis", 2000, 2nd edition, Prentice Hall.*
8. *P. Brass, "Advanced Data Structures", 2008, Cambridge University Press.*

COURSE OBJECTIVES

- ➔ *To learn the basics of programing*
- ➔ *To learn basic concepts of data structures*
- ➔ *To design and analyses the algorithms*

MAPPING OF Cos with POs

COURSE OUTCOMES (CO	Programme Outcomes (PO)
Design and implement abstract data types/Data structures.	1,2,5,8
Design and analysis of algorithms	1,2,3,5

COURSE PLAN – PART II

COURSE OVERVIEW

The purpose of the course is to provide the students with solid foundations in the basic concepts of various data structures and algorithms. This course teaches the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also showing the correctness of the algorithms and studying their computational complexities**.**

Week	#Class	Topic	Mode of Delivery
1	Class I	Introduction to Data structures and its important	Talk, Chalk
	Class II	Arrays and Linked List ADT	Talk, Chalk
	Class III	Stack: Definition and examples, Representing Stacks, Stack implementation using array and linked list	Talk, Chalk

2	**Class I**	**Queues: Queue and its Representation, Queue implementation using array and linked list**	**Talk, Chalk**
	Class II	**Applications of Stack, Expression evaluation Backtracking, Memory management, run-time environment for nested language features.**	**Talk, Chalk**
	Class III	**Applications of Queue and Linked Lists: CPU scheduling, Breadth First search**	**Talk, Chalk**
3	**Class I**	**Binary Trees basics and terminologies**	**Talk, Chalk**
	Class II	**Binary Tree Representations – node representation, internal and external nodes, implicit array representation**	**Talk, Chalk**
	Class III	**Operations on binary trees and its implementation**	**Talk, Chalk**
	Class IV	**Binary tree Traversals.**	**Talk, Chalk, Power point presentation**
4	**Class I**	**Representing Lists as Binary Trees**	**Talk, Chalk**
	Class II	**Binary Search Tree concepts**	**Talk, Chalk, Power point presentation**
	Class III	**Binary Search Tree operations**	**Talk, Chalk**
5	**Class I**	**Algorithms – Analyzing and Designing algorithms**	**Talk, Chalk**
	Class II	**Asymptotic notations**	**Talk, Chalk**
	Class III	**Recurrences and its solving methods**	**Talk, Chalk**
	Class IV	**Basics of sorting techniques, selection sort**	**Power point presentation**
6	**Class I**	**Bubble sort, Insertion sort**	**Talk, Chalk, Power point presentation**
	Class II	**Merge sort**	**Power point presentation**
	Class III	**Basic Search Techniques : linear search**	**Talk, Chalk, Power point presentation**
7	**Class I**	**Basic Search Techniques : binary search**	**Power point presentation**
	Class II	**Revisiting various operations of different data structures with time complexity analysis**	**Talk, Chalk, Power point presentation**
	Class III	**Revisiting various operations of different data structures with time complexity analysis**	**Talk, Chalk, Power point presentation**
	Class IV	**Design and Analysis of Heap Sort**	**Talk, Chalk, Power point presentation**
8	**Class I**	**Quick Sort**	**Talk, Chalk**
	Class II	**Quick Sort – Sorting in linear time**	**Talk, Chalk, Power point presentation**
	Class III	**Radix sort – Selection in linear time.**	**Talk, Chalk**

	Class IV	**Design Strategies: Recursion**	**Talk, Chalk, Power point presentation**
9	**Class I**	**Divide and conquer methodology**	**Talk, Chalk, Power point presentation**
	Class II	**Multiplication of large integers**	**Talk, Chalk**
	Class III	**Strassen's matrix multiplication**	**Talk, Chalk**
10	**Class I**	**Greedy method : Prim's algorithm, Kruskal's algorithm**	**Talk, Chalk**
	Class II	**algorithm for Huffman codes**	**Talk, Chalk**
	Class III	**Dynamic Programming – Backtracking and Branch and bound method**	**Talk, Chalk**

COURSE ASSESSMENT METHODS				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
1	**Cycle Test 1**	**6th week**	**60 Minutes**	**20%**
2	**Projects**	**Every week**	**-**	**30%**
3	**Assignment/Seminar**	**7th to 10th Week**	**6 days**	**10%**
CPA	**Compensation Assessment***	**12th week**	**120 Minutes**	**40%**
4	**Semester Exam**	**December**	**180 Minutes**	**4 0%**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. The students through the class rep may give their feedback at any time to the course coordinator which will be duly addressed.
2. The students may also give their feedback during Class Committee meeting.
3. 'Course Outcome Survey' form will be distributed on the last working day to all the students and the feedback on various rubrics will be analyzed.
4. The COs will be computed after arriving at the final marks.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

At classes:

Interactive and productive interactions are anticipated. Abusive terms are highly restricted. Attendance is noted for every class. Appreciate if they are willing to prepare for placement and participating social services after informing properly to the department.

Exam Policy:

Exams are equal to all the students. No privileges will be given to any one at any cost. **Students who are all absent for both the cycle test for a genuine reason may be given CPA.** Assignments and projects are mandatory and should be submitted by the notification of the teacher.

Basic Policies on dishonest or Misconduct:

Students are encouraged to come with notebooks and encouraged to note down from teachers lecture. Asked to avoid electronic gadgets and unwanted notes at the time of examinations. Copying and re using existing notes for assignments are not appreciable.

Attendance Policy: (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ADDITIONAL COURSE INFORMATION

The students can get their doubts clarified at any time with their faculty member with prior appointment.

For Senate's Consideration

Course Faculty _____ **PAC-Chairperson** _____ **HOD** _____