Department of Computer Applications
National Institute of Technology Tiruchirappalli

1.Course Outline			
Course Title	Design and Analysis of Algorithms		
Course Code	CA729		
Department	CA	**No. of Credits**	3
Pre-requisites Course Code	CA710, CA713	**Faculty Name**	1. Dr. Michael Arock 2. Dr.R.Eswari
PAC Chairman	Dr. P.J.A.Alphonse		
E-mail	michael@nitt.edu eswari@nitt.edu	**Telephone No.**	0431-2503736 0431-2503744
Course Type	Core Course		

2. Course Overview

This course covers topics on motivation,Asymptoticcomplexity,binarysearch,Sorting,search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths, back tracking, Intractability, NP-hard and NP-complete problems.Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice.

3. Course Objectives

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

4. Course Outcomes (CO)

Students will be able to:

- Analyze the complexity of polynomial algorithms.
- Apply various algorithm design strategies for solving problems.
- Distinguish NP-hard and NP-complete problems from other problems.
- Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

5. Course Outcome (CO)	Aligned Programme Outcome (PO)											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Analyze the complexity of polynomial algorithms.		L	H					M				
Apply various algorithm design strategies for solving problems.	L			M		H						
Distinguish NP-hard and NP-complete problems from other problems.		H			L				M			
Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.		M		H						L		

6. Course Teaching and Learning Activities			
Week	**No. of Classes**	**Topic Covered**	**Mode of Delivery**
1	Class-I	Introduction	Chalk and Talk , Power Point Presentation
	Class-II	Examples and motivation	Chalk and Talk , Power Point Presentation
	Class-III	Algorithm as a Technology	Chalk and Talk , Power Point Presentation
2	Class-I	Growth of Functions	Chalk and Talk , Power Point Presentation
	Class-II	Asymptotic complexity: formal Notations	Chalk and Talk , Power Point Presentation
	Class-III	Asymptotic complexity: examples	Chalk and Talk , Power Point Presentation
3	Class-I	Recurrences	Chalk and Talk , Power Point Presentation
	Class-II	Methods to solve recurrences	Chalk and Talk , Power Point Presentation
	Class-III	Insertion Sort	Chalk and Talk , Power Point Presentation
4	Class-I	Merge sort	Chalk and Talk , Power Point Presentation
	Class-II	Heap sort	Chalk and Talk , Power Point Presentation
	Class-III	Quick sort	Chalk and Talk , Power Point Presentation
5	Class-I	Sorting in linear time	Chalk and Talk , Power Point Presentation
	Class-II	Selection in linear time	Chalk and Talk , Power Point Presentation
	Class-III	Divide and conquer methodology	Chalk and Talk , Power Point Presentation

6	Class-I	Matrix multiplication	Chalk and Talk , Power Point Presentation
	Class-II	Greedy method: Prim's and Kruskal'salgorithms	Chalk and Talk , Power Point Presentation
	Class-III	Algorithm for Huffman codes	Chalk and Talk , Power Point Presentation
7	Class-I	Dynamic Programming: Matrix-chain multiplications	Chalk and Talk , Power Point Presentation
	Class-II	Bionomial coefficient, Floyd-Warshall algorithm	Chalk and Talk , Power Point Presentation
	Class-III	Backtracking: N-Queens problem	Chalk and Talk , Power Point Presentation
8	Class-I	Hamiltonian circuit and sum of subset problems	Chalk and Talk , Power Point Presentation
	Class-II	Branch and Bound: Assignment problem	Chalk and Talk , Power Point Presentation
	Class-III	knapsack problems	Chalk and Talk , Power Point Presentation
9	Class-I	Travelling salesman problem	Chalk and Talk , Power Point Presentation
	Class-II	NP-hard and NP-complete problems	Chalk and Talk , Power Point Presentation
	Class-III	Reducibility and Cook's Theorem	Chalk and Talk , Power Point Presentation
10	Class-I	Clique decision problem	Chalk and Talk , Power Point Presentation
	Class-II	Node cover and K-coloring problems	Chalk and Talk , Power Point Presentation
	Class-III	Advanced Topics	Chalk and Talk , Power Point Presentation

7. Course Assessment Methods – Theorey

Sl. No.	Mode of Assessment	Week/Date	Duration	Weightage(%)
1.	Assessment –1	6th week	60 mins	20
2.	Assessment –2	12th week	60 mins	20
3.	Assignment	7thand 10thweek	7 days	10
4.	End Semester Exam	-	180 mins	50
			Total	100

8. Essential Readings (Textbooks, Reference books, Websites, Journals, etc.)

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, MIT Press,2009.
2. Robert Sedgewick and Philippe Flajolet, "An Introduction to the Analysis of Algorithms", 2nd Edition, Addison-Wesley,2013.
3. Jon Kleinberg and ÉvaTardos, "Algorithm Design",Addison-Wesley,2005.
4. George T. Heineman, Gary Pollice and Stanley Selkow, "Algorithms in a Nutshell", O'Reilly Media, 2008.

5. SanjoyDasgupta, Christos Papadimitriou and UmeshVazirani,"Algorithms", McGrawHill,2006.
6. E.Horowitz, S.Sahni, and S.Rajasekaran, "Computer Algorithms", 2nd edition, Silicon Press,2007.

9. Course Exit Survey (mention the ways by which the feedback about the course is assessed and indicate the attainment level)

1. The students through the class rep may give their feedback at any time to the course co-ordinator 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.

10. Course Policy (including plagiarism, academic honesty, attendance, etc.)

- **Plagiarism**
  The students are expected to come out with their original code for problems given assignments during the class work, and tests/examinations. If found to copy from internet/other students, zero marks will be assigned.

- **Attendance**
  100% is a must. However, relaxation will be given for leave on emergency requirements (medical, etc.) and representing institute events. Minimum 75% is required.

- **Academic Honesty**
  i. Possession of any electronic device, if any, found during the test or exam, the student will be debarred for 3 years from appearing for the exam and this will be printed in the Grade statement/Transcript.
  ii. Tampering of MIS records, if any, found, then the results of the student will be with held and the student will not be allowed to appear for the Placement interviews conducted by the Office of Training & Placement, besides (i).

11. Additional Course Information

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

For Senate's Consideration

1. Dr. Michael Arock

2. Dr.R.Eswari

(Course Faculty)

Dr. P.J.A.Alphonse
Class Committee
Chairperson

Dr. S.R.Balasundaram
HOD