INSTITUTO POLITECNICO NACIONAL

SECRETARÍA DE INVESTIGACIÓN Y POSGRADO

DIRECCIÓN DE POSGRADO

FORMATO GUIA PARA REGISTRO DE ASIGNATURAS

I. DATOS DEL PROGRAMA Y LA ASIGNATURA

1.1 NOMBRE DEL PROGRAMA: **Maestría en Ciencias de la Computación**

1.2 COORDINADOR DEL PROGRAMA: Dr. Amadeo José Argüelles Cruz

1.3 NOMBRE DE LA ASIGNATURA: **Diseño y Analisis de Algoritmos** / Design and Analisys of Algorithms

1.4 CLAVE: _____ (Para ser llenado por la SIP)

1.5 TIPO DE ASIGNATURA:

OBLIGATORIA	X	OPTATIVA	
SEMINARIO		ESTANCIA	

1.6 NUMERO DE HORAS:

TEORIA	80	PRACTICA		T-P	

1.7 UNIDADES DE CREDITO: **8**

1.8 FECHA DE LA ELABORACION DEL PROGRAMA DE LA ASIGNATURA:

14	11	2013
d	m	a

1.9 SESION DEL COLEGIO DE PROFESORES EN QUE SE ACORDO LA IMPLANTACION DE LA ASIGNATURA:

SESION No.	3 Extr.	FECHA:	13	11	2013
			d	m	a

1.10 FECHA DE REGISTRO EN SIP:

d	m	a

(Para ser llenado por la SIP)

II. DATOS DEL PERSONAL ACADEMICO (CELDA DE ENFOQUE)

2.1	COORD. ASIGNATURA:	**Dr. Rolando Menchaca Méndez**	CLAVE:	9441-EF-13
2.2	PROFR. PARTICIPANTE	Dr. Amadeo José Argüelles Cruz	CLAVE:	1088-EH-14
2.2	PROFR. PARTICIPANTE:	Dr. José Luis Oropeza Rodríguez	CLAVE:	8996-EC-12
2.2	PROFR. PARTICIPANTE:	Dr. Luis Pastor Sánchez Fernández	CLAVE:	8706-EE-12
2.3	PROFR. PARTICIPANTE	Dr. René Luna García	CLAVE:	9440-EC-13
2.4	PROFR. PARTICIPANTE	Dr. Ricardo Barrón Fernández	CLAVE:	9160-EH-13

III. DESCRIPCION DEL CONTENIDO DEL PROGRAMA DE LA ASIGNATURA

III.1 OBJETIVO GENERAL:

Introduction to the design and analysis of efficient algorithms. Topics include models of computation, efficient sorting and searching, algorithms for algebraic problems, graph algorithms, dynamic programming, probabilistic methods, approximation algorithms, and NP-completeness.

III.2 DESCRIPCION DEL CONTENIDO

TEMAS Y SUBTEMAS	TIEMPO
1. Introduction: Some representative problems	6 HRS.
1.1. Stable Matching 1.2. Five representative problems	
1.2.1. Interval scheduling 1.2.2. Weighted interval scheduling 1.2.3. Bipartite matching 1.2.4. Independent set	
2. Basics of Algorithm Analysis	6 HRS.
2.1. Computational tractability 2.2. Asymptotic order of growth	
2.2.1. Asymptotic notation 2.2.2. Standard notation and common functions 2.3. A survey of common running times	
3. Graphs	6 HRS.
3.1. Basic definitions and applications 3.2. Connectivity and graph traversal 3.3. Testing bipartiteness 3.4. Connectivity in directed graphs 3.5. Directed acyclic graphs and topological ordering	
4. Greedy algorithms	6 HRS.
4.1. Interval scheduling 4.2. Minimum lateness scheduling 4.3. Optimal caching 4.4. Shortest paths in graphs 4.5. The minimum spanning tree problem 4.6. Clustering	

5. Divide and Conquer	6 HRS.
5.1. Mergesort algorithm 5.2. Recurrence relations and the master method 5.3. Counting inversions 5.4. Finding the closests pair of points 5.5. Integer multiplication 5.6. Convolutions and the Fast Fourier Transform	
6. Dynamic Programming	6 HRS.
6.1. Weighted interval scheduling 6.2. Principles of Dynamic Programming 6.3. Segmented least squares 6.4. Subset sums and knapsacks 6.5. RNA secondary structure 6.6. Shortest paths in a graph	
7. Network Flow	6 HRS.
7.1. The Maximum-Flow Problem and the Ford-Fulkerson Algorithm 7.2. Maximum and Minimum Cuts in a Network 7.3. Good Augmenting Paths 7.4. Applications	
7.4.1. Bipartite Matching Problem 7.4.2. Disjoint Paths in Directed and Undirected Graphs 7.4.3. Image Segmentation	
8. Linear Programming	6 HRS.
8.1. Geometry of Linear Programming 8.2. The Simplex Method 8.3. Duality and Sensitivity	
9. Nonlinear Optimization	6 HRS.
9.1. Optimality Conditions for Constrained Problems 9.2. Feasible-Point Methods	
10. NP and Computational Intractability	6 HRS.
10.1. Polynomial-Time Reductions 10.2. Efficient Certification and the Definition of NP 10.3. NP-Complete Problems 10.4. NP-Hard Problems	
11. Approximation Algorithms	6 HRS.
11.1. Greedy Algorithms and Bounds on the Optimum 11.2. A Load Balancing Problem 11.3. The Center Selection Problem 11.4. Set Cover: A General Greedy Heuristic 11.5. The Pricing Method 11.6. Linear Programming and Rounding	
12. Local Search	6 HRS.
12.1. The Landscape of a Combinatorial Optimization Problem 12.2. The Metropolis Algorithm and Simulated Annealing 12.3. Maximum-Cut Approximation via Local Search 12.4. Neighbor Relations 12.5. Best-Response Dynamics and Nash Equilibria	
13. Randomized Algorithms	8 HRS.
13.1. Contention Resolution in a Distributed System 13.2. Global Minimum Cut: Contraction Algorithm 13.3. Expectation: Coupon Collector 13.4. Random Quick Sort 13.5. Maximum 3-Satisfiability and The Probabilistic Method 13.6. Monte Carlo vs. Las Vegas Algorithms	
TOTAL:	80 HRS.

III.3 BIBLIOGRAFIA UTILIZADA EN LA ASIGNATURA

1. Algorithm Design. Jon Kleinberg & Eva Tardos (Primary reference)
2. Introduction to Algorithms, Third Ed. T. H. Cormen, et al.
3. Algorithms. S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani.
4. Linear and Nonlinear Programming, Second Ed. I. Griva, S.G. Nash, and A. Sofer

III.4 PROCEDIMIENTOS O INSTRUMENTOS DE EVALUACION A UTILIZAR

1 Tres exámenes: 60%

2 Tareas y prácticas: 40%

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