



National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme		Bachelor of Technology in Computer Science and Engineering					Academic Year of Regulation			2018-19						
Department		Computer Science and Engineering					Semester			VIII						
Course Code	Course Name	Credit Structure				Marks Distribution										
		L	T	P	C	INT	MID	END	Total							
CS 426	Bioinformatics	3	0	0	3	50	50	100	200							
Course Objectives	This course introduces the importance of bioinformatics and analysis of biological databases		Course Outcomes	CO1	Able to discover different problems prevailing in bioinformatics domain											
	This course explains the different types of bioinformatics techniques			CO2	Able to assess different bioinformatics techniques											
	This course introduces the different bioinformatics and machine learning techniques to different application domains			CO3	Able to design computational framework for solving problems related to biological data analysis											
No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	1	1	-	-	-	-	-	-	-	-	-	-	1	1	-
2	CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	1	-
3	CO3	1	2	2	-	2	-	-	-	-	-	-	-	2	2	-
SYLLABUS																
No.	Content													Hours	COs	
I	Introduction: Bioinformatics, goals, scope, applications and limitations, Basic cell architecture, The structure, content and scale of deoxyribonucleic acid (DNA), Genes and proteins, Central dogma, Importance of proteins, Gene and cell regulation, Biological Databases, Information Retrieval from Biological Databases													06	CO1	
II	Sequence Alignment: Pair-wise sequence alignment, Sequence homology versus sequence similarity, Sequence similarity versus sequence identity, Methods for sequence alignment, Statistical significance of sequence alignment Multiple Sequence Alignment : Scoring function, Exhaustive algorithms, Heuristic algorithms, practical Issues													08	CO1, CO2	
III	Database similarity searching : Basic Local Alignment Search Tool (BLAST), FASTA, Comparison of FASTA and BLAST Protein motifs and domain prediction :Identification of motifs and domains in multiple sequence alignment, Motif and domain databases using regular expressions, Motif and Domain Databases Using statistical models Gene Prediction : Gene prediction in prokaryotes and in eukaryotes Phylogenetics : Terminology, Gene phylogeny versus species phylogeny, Phylogenetic tree construction, Distance – based methods, Character- based methods, Phylogenetic tree evaluation													14	CO2	
IV	Functional Genomics : Sequence-based approaches, Microarray-based approaches, Comparison of SAGE and DNA microarrays Case studies for machine learning techniques based analysis of biological datasets													08	CO2 & CO3	
Total Hours													36			
Essential Readings																
1. J. Xiong. "Essential bioinformatics". Cambridge University Press, 1st edition, 2006.																
2. E. Keedwell, and A. Narayanan. "Intelligent bioinformatics: The application of artificial intelligence techniques to bioinformatics problems". John Wiley & Sons, 1st edition, 2005																
3. J.M. Claverie, and C. Notredame. "Bioinformatics for dummies". John Wiley & Sons, 2nd edition, 2007																
Supplementary Readings																
1. S. Mitra, S. Datta, T. Perkins, and G. Michailidis. "Introduction to machine learning and bioinformatics". CRC Press, 1st edition, 2008.																
2. Z.R. Yang. "Machine learning approaches to bioinformatics". World scientific, 1st edition, 2010																
3. Y.Q. Zhang, and J.C. Rajapakse. "Machine learning in bioinformatics", Wiley, 1st edition, 2009																