JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABUS (R18)

Applicable From 2018-19 Admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics - I	3	1	0	4
2	CH102BS	Chemistry	3	1	0	4
3	EE103ES	Basic Electrical Engineering	3	0	0	3
4	ME105ES	Engineering Workshop	1	0	3	2.5
5	EN105HS	English	2	0	0	2
6	CH106BS	Engineering Chemistry Lab	0	0	3	1.5
7	EN107HS	English Language and Communication Skills Lab	0	0	2	1
8	EE108ES	Basic Electrical Engineering Lab	0	0	2	1
		Induction Programme				
		Total Credits	**12**	**2**	**10**	**19**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Mathematics - II	3	1	0	4
2	AP202BS	Applied Physics	3	1	0	4
3	CS203ES	Programming for Problem Solving	3	1	0	4
4	ME204ES	Engineering Graphics	1	0	4	3
5	AP205BS	Applied Physics Lab	0	0	3	1.5
6	CS206ES	Programming for Problem Solving Lab	0	0	3	1.5
7	*MC209ES	Environmental Science	3	0	0	0
		Total Credits	**13**	**3**	**10**	**18**

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS301ES	Analog and Digital Electronics	3	0	0	3
2	CS302PC	Data Structures	3	1	0	4
3	MA303BS	Computer Oriented Statistical Methods	3	1	0	4
4	CS304PC	Computer Organization and Architecture	3	0	0	3
5	CS305PC	Object Oriented Programming using C++	2	0	0	2
6	CS306ES	Analog and Digital Electronics Lab	0	0	2	1
7	CS307PC	Data Structures Lab	0	0	3	1.5
8	CS308PC	IT Workshop Lab	0	0	3	1.5
9	CS309PC	C++ Programming Lab	0	0	2	1
10	*MC309	Gender Sensitization Lab	0	0	2	0
		Total Credits	**14**	**2**	**12**	**21**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS401PC	Discrete Mathematics	3	0	0	3
2	SM402MS	Business Economics & Financial Analysis	3	0	0	3
3	CS403PC	Operating Systems	3	0	0	3
4	CS404PC	Database Management Systems	3	1	0	4
5	CS405PC	Java Programming	3	1	0	4
6	CS406PC	Operating Systems Lab	0	0	3	1.5
7	CS407PC	Database Management Systems Lab	0	0	3	1.5
8	CS408PC	Java Programming Lab	0	0	2	1
9	*MC409	Constitution of India	3	0	0	0
		Total Credits	**18**	**2**	**8**	**21**

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS501PC	Formal Languages & Automata Theory	3	0	0	3
2	CS502PC	Software Engineering	3	0	0	3
3	CS503PC	Computer Networks	3	0	0	3
4	CS504PC	Web Technologies	3	0	0	3
5		Professional Elective-I	3	0	0	3
6		Professional Elective -II	3	0	0	3
7	CS505PC	Software Engineering Lab	0	0	3	1.5
8	CS506PC	Computer Networks & Web Technologies Lab	0	0	3	1.5
9	EN508HS	Advanced Communication Skills Lab	0	0	2	1
10	*MC510	Intellectual Property Rights	3	0	0	0
		Total Credits	**21**	**0**	**8**	**22**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS601PC	Machine Learning	3	1	0	4
2	CS602PC	Compiler Design	3	1	0	4
3	CS603PC	Design and Analysis of Algorithms	3	1	0	4
4		Professional Elective – III	3	0	0	3
5		Open Elective-I	3	0	0	3
6	CS604PC	Machine Learning Lab	0	0	3	1.5
7	CS605PC	Compiler Design Lab	0	0	3	1.5
8		Professional Elective-III Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

*MC609 - Environmental Science – Should be Registered by Lateral Entry Students Only.

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	CS701PC	Cryptography & Network Security	3	0	0	3
2	CS702PC	Data Mining	2	0	0	2
3		Professional Elective -IV	3	0	0	3
4		Professional Elective -V	3	0	0	3
5		Open Elective - II	3	0	0	3
6	CS703PC	Cryptography & Network Security Lab	0	0	2	1
7	CS704PC	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2*
8	CS705PC	Seminar	0	0	2	1
9	CS706PC	Project Stage - I	0	0	6	3
		Total Credits	**14**	**0**	**10**	**21**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	SM801MS	Organizational Behaviour	3	0	0	3
2		Professional Elective - VI	3	0	0	3
3		Open Elective - III	3	0	0	3
4	CS802PC	Project Stage - II	0	0	14	7
		Total Credits	**9**	**0**	**14**	**16**

*MC – Satisfactory/Unsatisfactory

Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

Professional Elective - I

CS511PE	Information Theory & Coding
CS512PE	Advanced Computer Architecture
CS513PE	Data Analytics
CS514PE	Image Processing
CS515PE	Principles of Programming Languages

Professional Elective - II

CS521PE	Computer Graphics
CS522PE	Advanced Operating Systems
CS523PE	Informational Retrieval Systems
CS524PE	Distributed Databases
CS525PE	Natural Language Processing

Professional Elective - III

CS611PE	Concurrent Programming
CS612PE	Network Programming
CS613PE	Scripting Languages
CS614PE	Mobile Application Development
CS615PE	Software Testing Methodologies

 # Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Professional Elective - IV

CS711PE	Graph Theory
CS712PE	Introduction to Embedded Systems
CS713PE	Artificial Intelligence
CS714PE	Cloud Computing
CS715PE	Ad-hoc & Sensor Networks

Professional Elective - V

CS721PE	Advanced Algorithms
CS722PE	Real Time Systems
CS723PE	Soft Computing
CS724PE	Internet of Things
CS725PE	Software Process & Project Management

Professional Elective – VI

CS811PE	Computational Complexity
CS812PE	Distributed Systems
CS813PE	Neural Networks & Deep Learning
CS814PE	Human Computer Interaction
CS815PE	Cyber Forensics

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S.No.	Semester	Course Code	Course Name	CO NO	Course outcome (Cos)
					NAME OF THE PROGRAM: R18 B.Tech. COMPUTER SCIENCE AND ENGINEERING
1	1 SEM	**MA101BS**	MATHEMATICS - I	CO1	Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
				C02	Find the Eigen values and Eigen vectors
				CO3	Reduce the quadratic form to canonical form using orthogonal transformations.
				CO4	Analyse the nature of sequence and series.
				CO5	Solve the applications on the mean value theorems.
				CO6	Evaluate the improper integrals using Beta and Gamma functions
				CO7	Find the extreme values of functions of two variables with/ without constraints.
2		CH102BS /CH202BS	CHEMISTRY	CO1	The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
				CO2	The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
				CO3	The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
				CO4	The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.
3		EE103ES/ EE203ES	BASIC ELECTRICAL ENGINEERING	CO1	To analyze and solve electrical circuits using network laws and theorem
				CO2	To understand and analyze basic Electric and Magnetic circuits
				CO3	To study the working principles of Electrical Machines
				CO4	To introduce components of Low Voltage Electrical Installations
4		ME105ES /ME205ES	ENGINEERING WORKSHOP	CO1	Study and practice on machine tools and their operations
				CO2	Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
				CO3	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
				CO4	Apply basic electrical engineering knowledge for house wiring practice.
5		EN105HS	ENGLISH	CO1	Use English Language effectively in spoken and written

		/EN205HS		CO1	forms.
				CO2	Comprehend the given texts and respond appropriately.
				CO3	Communicate confidently in various contexts and different cultures.
				CO4	Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
6	2 SEM	MA201BS	MATHEMATICS - II	CO1	Identify whether the given differential equation of first order is exact or not
				CO2	Solve higher differential equation and apply the concept of differential equation to real world problems
				CO3	Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
				CO4	Evaluate the line, surface and volume integrals and converting them from one to another
7		AP102BS/ AP202BS	APPLIED PHYSICS	CO1	The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
				CO2	The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
				CO3	Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
				CO4	The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials
				CO5	Speaking skills with clarity and confidence which in turn enhances their employability skills
8		CS103ES/ CS203ES	PROGRAMMING FOR PROBLEM SOLVING	CO1	To write algorithms and draw flowcharts for solving problems.
				CO2	To convert the algorithms, flowcharts to c programs
				CO3	To code and test a given login in c programming language
				CO4	To decompose a problem into functions and develop modular reuable code
				CO5	To use arrays, pointers strings and structures to write c programs
				CO6	Searching and sorting problems
9		ME104ES /ME204ES	: ENGINEERING GRAPHICS	CO1	Preparing working drawings to communicate the ideas and information.
				CO2	Read, understand and interpret engineering drawings.
10	3SEM	CS301ES	ANALOG	CO1	Know the characteristics of various components.

			AND DIGITAL ELECTRONICS	CO2	Understand the utilization of components
				CO3	Design and analyze small signal amplifier circuits.
				CO4	Learn Postulates of Boolean algebra and to minimize combinational functions
				CO5	Design and analyze combinational and sequential circuits
				CO6	Know about the logic families and realization of logic gates.
13		CS302PC	: DATA STRUCTURES	CO1	Ability to select the data structures that efficiently model the information in a problem.
				CO2	Ability to assess efficiency trade-offs among different data structure implementations or combinations.
				CO3	Implement and know the application of algorithms for sorting and pattern matching.
				CO4	Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
14		MA303BS	COMPUTER ORIENTED STATISTICAL METHODS	CO1	Apply the concepts of probability and distributions to some case studies
				CO2	Correlate the material of one unit to the material in other units
				CO3	Resolve the potential misconceptions and hazards in each topic of study.
15		CS304PC	COMPUTER ORGANIZATION AND ARCHITECTURE	CO1	Understand the basics of instructions sets and their impact on processor design.
				CO2	Demonstrate an understanding of the design of the functional units of a digital computer system.
				CO3	Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
				CO4	Design a pipeline for consistent execution of instructions with minimum hazards.
				CO5	Recognize and manipulate representations of numbers stored in digital computers
16		CS305PC	OBJECT ORIENTED PROGRAMMING USING C++	CO1	Able to develop programs with reusability
				CO2	Develop programs for file handling
				CO3	Handle exceptions in programming
				CO4	Develop applications for a range of problems using object-oriented programming techniques
17	4SEM	CS401PC	DISCRETE MATHEMATICS	CO1	Ability to understand and construct precise mathematical proofs
				CO2	Ability to use logic and set theory to formulate precise statements

				CO3	Ability to analyze and solve counting problems on finite and discrete structures
				CO4	Ability to describe and manipulate sequences
				CO5	Ability to apply graph theory in solving computing problems
18		SM402M S/SM305 MS	BUSINESS ECONOMIC S AND FINANCIAL ANALYSIS	CO1	The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.
19			OPERATING SYSTEMS	CO1	Will be able to control access to a computer and the files that may be shared
				CO2	Demonstrate the knowledge of the components of computer and their respective roles in computing.
				CO3	Ability to recognize and resolve user problems with standard operating environments.
				CO4	Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively
20		CS404PC	DATABAS E MANAGE MENT SYSTEMS	CO1	Gain knowledge of fundamentals of DBMS, database design and normal forms
				CO2	Master the basics of SQL for retrieval and management of data.
				CO3	Be acquainted with the basics of transaction processing and concurrency control.
				CO4	Familiarity with database storage structures and access techniques
21		CS405PC	JAVA PROGRAM MING	CO1	Able to solve real world problems using OOP techniques.
				CO2	Able to understand the use of abstract classes.
				CO3	Able to solve problems using java collection framework and I/o classes.
				CO5	Able to develop multithreaded applications with synchronization.
				CO6	Able to develop applets for web applications.
				CO7	Able to design GUI based applications
22	5SEM	CS501PC	FORMAL LANGUAGE S AND AUTOMAT	CO1	Able to understand the concept of abstract machines and their power to recognize the languages.
				CO2	Able to employ finite state machines for modeling and solving computing problems.
				CO3	Able to design context free grammars for formal

			A THEORY		languages.
				CO4	Able to distinguish between decidability and undecidability.
				CO5	Able to gain proficiency with mathematical tools and formal methods.
23		CS502PC	SOFTWARE ENGINEERING	CO1	Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
				CO2	Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
				CO3	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
24		CS503PC	COMPUTER NETWORKS	CO1	Gain the knowledge of the basic computer network technology.
				CO2	Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
				CO3	Obtain the skills of subnetting and routing mechanisms.
				CO4	Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.
25		CS504PC	WEB TECHNOLOGIES	CO1	gain knowledge of client-side scripting, validation of forms and AJAX programming
				CO2	understand server-side scripting with PHP language
				CO3	understand what is XML and how to parse and use **XML** Data with Java
				CO4	To introduce Server-side programming with Java Servlets and JSP
26		CS513PE	DATA ANALYTICS (Professional Elective - I)	CO1	Understand the impact of data analytics for business decisions and strategy
				CO2	Carry out data analysis/statistical analysis
				CO3	To carry out standard data visualization and formal inference procedures
				CO4	Design Data Architecture
				CO5	Understand various Data Sources
27		CS521PE	COMPUTER GRAPHICS (Professional Elective - II)	CO1	Acquire familiarity with the relevant mathematics of computer graphics.
				CO2	Be able to design basic graphics application programs, including animation
				CO3	Be able to design applications that display graphic images to given specifications
28	6 SEM	CS601PC	MACHINE LEARNING	CO1	Understand the concepts of computational intelligence like machine learning

				CO2	Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
				CO3	Understand the Neural Networks and its usage in machine learning application.
29		CS602PC	COMPILER DESIGN	CO1	Demonstrate the ability to design a compiler given a set of language features.
				CO2	Demonstrate the the knowledge of patterns, tokens & regular expressions for lexical analysis.
				CO3	Acquire skills in using lex tool & yacc tool for devleoping a scanner and parser.
				CO4	Design and implement LL and LR parsers
				CO5	Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
				CO6	Design algorithms to generate machine code.
30		CS603PC	DESIGN AND ANALYSIS OF ALGORITH MS	CO1	Ability to analyze the performance of algorithms
				CO2	Ability to choose appropriate data structures and algorithm design methods for a specified application
				CO3	Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
31		CS615PE:	SOFTWARE TESTING METHODOL OGIES (Professional Elective - III)	CO1	: Design and develop the best test strategies in accordance to the development model.
32		EC600OE	FUNDAMEN TALS OF INTERNET OF THINGS (Open Elective – I)	CO1	Known basic protocols in sensor networks.
				CO2	Program and configure Arduino boards for various designs.
				CO3	Python programming and interfacing for Raspberry Pi.
				C04	Design IoT applications in different domains.
33	7SEM	CS701PC	CRYPTOGR APHY AND NETWORK SECURITY (PC)	CO1	Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
				CO2	Ability to identify information system requirements for both of them such as client and server.
				CO3	Ability to understand the current legal issues towards information security.
				CO4	Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.

				CO5	Ability to identify information system requirements for both of them such as client and server.
				CO6	Ability to understand the current legal issues towards information security.
34		CS702PC	DATA MINING (PC)	CO1	Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
				CO2	Apply preprocessing methods for any given raw data.
				CO3	Extract interesting patterns from large amounts of data.
				CO4	Discover the role played by data mining in various fields.
				CO5	Choose and employ suitable data mining algorithms to build analytical applications
				CO6	Evaluate the accuracy of supervised and unsupervised models and algorithms.
35		CS714PE	CLOUD COMPUTING (Professional Elective - IV)	CO1	Ability to understand various service delivery models of a cloud computing architecture.
				CO2	Ability to understand the ways in which the cloud can be programmed and deployed.
				CO3	Understanding cloud service providers.
36		CS725PE	SOFTWARE PROCESS & PROJECT MANAGEMENT (Professional Elective - V	CO1	Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
				CO2	Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
				CO3	Design and develop software product using conventional and modern principles of software project management
38		CS814PE	HUMAN COMPUTER INTERACTION (Professional Elective - VI)	CO1	Ability to apply HCI and principles to interaction design.
				CO2	Ability to design certain tools for blind or PH people.