



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

**II B.TECH.**

**Semester-III**

S.No	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	20A54304	Discrete Mathematics & Graph Theory	BS	3	0	0	3
2.	20A04304T	Digital Electronics& Microprocessors	ES	3	0	0	3
3.	20A05303	Computer Organization	PC	3	0	0	3
4.	20A05301T	Advanced Data Structures & Algorithms	PC	3	0	0	3
5.	20A35301T	Sensor and IoT	PC	3	0	0	3
6.	20A04304P	Digital Electronics& Microprocessors Lab	ES	0	0	3	1.5
7.	20A05301P	Advanced Data Structures and Algorithms Lab	PC	0	0	3	1.5
8.	20A35301P	Sensor and IoT Lab					
9	20A35302	<b>Skill Oriented Course – I</b> Programming Arduino	SC	1	0	2	2
10	20A99201	<b>Mandatory noncredit course - II</b> Environmental Science	MC	3	0	0	0
<b>Total</b>							<b>21.5</b>

**Semester-IV**

S.No	Course Code	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	20A54406	Mathematical Modeling and Simulation	BS	3	0	0	3
2.	20A05401T	Database Management Systems	PC	3	0	0	3
3.	20A05402T	Operating Systems	PC	3	0	0	3
4.	20A05403T	Software Engineering	PC	3	0	0	3
5.	20A52301 20A52302 20A52303	<b>Humanities Elective– I</b> Managerial Economics & Financial Analysis Organizational Behaviour Business Environment	HS	3	0	0	3
6.	20A05401P	Database Management SystemsLab	PC	0	0	3	1.5
7.	20A05402P	Operating SystemsLab	PC	0	0	3	1.5
8.	20A05403P	Software Engineering Lab	PC	0	0	3	1.5
9.	20A35401	<b>Skill Oriented Course– II</b> Python Programming for IoT	SC	1	0	2	2
10.	20A99401	<b>Mandatory noncredit course – III</b> Design Thinking for Innovation	MC	2	1	0	0
11.	20A99301	NSS/NCC/NSO Activities	MC	0	0	2	0
<b>Total</b>							<b>21.5</b>
Community Service Internship/Project(Mandatory) for 6 weeks duration during summer vacation							



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**Computer Science & Engineering (Internet of Things)**

**Note:**

1. Eligible and interested students can register either for Honors or for a Minor in IV Semester as per the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in an activity for two hours in a week during fourth semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester



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**Computer Science & Engineering (Internet of Things)**

Course Code	Mathematical Modelling & Simulation	L	T	P	C
20A54406	CSE (Internet of Things)	0	3	0	3
Pre-requisite	Semester	IV			
Course Objectives:					
This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> <li>• understand basic Model Forms.</li> <li>• understand basic Simulation Approaches.</li> <li>• evaluate handling Stepped and Event-based Time in Simulations.</li> <li>• distinguish Discrete versus Continuous Modeling.</li> <li>• apply Numerical Techniques.</li> <li>• calculate Sources and Propagation of Error.</li> </ul>					
UNIT - I		8 Hrs			
Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modelling-Numerical Techniques-Sources and Propagation of Error					
UNIT - II		9 Hrs			
Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations					
UNIT - III		8 Hrs			
Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms-Handling Inter-partition Dependencies					
UNIT - IV		8 Hrs			
Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise-Random Variates Generation-Sensitivity Analysis					
UNIT - V		9 Hrs			
Simulations Results Analysis and Viewing Tools-Display Forms: Tables, Graphs, and Multidimensional Visualization-Terminals, X and MS Windows, and Web Interfaces-Validation of Model Results.					
Textbooks:					
<ol style="list-style-type: none"> <li>1. Mathematical modeling, JN Kapur, Newage publishers</li> <li>2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers by Kai Velten, Wiley Publishers</li> </ol>					
Reference Books:					



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**Computer Science & Engineering (Internet of Things)**

1. Introduction to Mathematical Modeling and Computer Simulations

By Vladimir Mityushev, [Wojciech Nawalaniec](#) [Natalia Rylko](#) Published by Chapman and Hall/CRC.

Online Learning Resources:

<http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf>

<https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379>

<https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers>



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 ANANTHAPURAMU – 515 002 (A.P) INDIA

**Computer Science & Engineering (Internet of Things)**

Course Code	DATABASE MANAGEMENT SYSTEMS (Common to CSE, IT, CSE( DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)		L	T	P	C
20A05401T			3	0	0	3
Pre-requisite	NIL	Semester	IV			
<b>Course Objectives:</b>						
<p>This course is designed to:</p> <ul style="list-style-type: none"> <li>• Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.</li> <li>• Enable students to model ER diagrams for any customized application</li> <li>• Inducting appropriate strategies for optimization of queries.</li> <li>• Provide knowledge on concurrency techniques</li> <li>• Demonstrate the organization of Databases</li> </ul>						
<b>Course Outcomes (CO):</b>						
<p>After completion of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Design a database for a real-world information system</li> <li>• Define transactions that preserve the integrity of the database</li> <li>• Generate tables for a database</li> <li>• Organize the data to prevent redundancy</li> <li>• Pose queries to retrieve the information from the database.</li> </ul>						
UNIT - I	<b>Introduction, Introduction to Relational Model</b>					9Hrs
<p><b>Introduction:</b> Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators,  <b>Introduction to Relational Model:</b> Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations</p>						
UNIT - II	<b>Introduction to SQL, Advanced SQL</b>					9 Hrs
<p><b>Introduction to SQL:</b> Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. <b>Intermediate SQL:</b> Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.  <b>Advanced SQL:</b> Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.</p>						
UNIT - III	<b>Database Design and the E-R Model, Relational Database Design</b>					8Hrs
<p><b>Database Design and the E-R Model:</b> Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.  <b>Relational Database Design:</b>          Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.</p>						
UNIT - IV	<b>Query Processing, Query optimization</b>					8 Hrs
<p><b>Query Processing:</b> Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.  <b>Query optimization:</b> Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.</p>						
UNIT - V	<b>Transaction Management, Concurrency Control, Recovery System</b>					10Hrs
<b>Transaction Management:</b>						



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements. <b>Concurrency Control:</b> Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols. <b>Recovery System:</b> Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.
Textbooks:
1. A.Silberschatz, H.F.Korth, S.Sudarshan, “Database System Concepts”,6/e, TMH 2019
Reference Books:
1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA 2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning. 3.Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
Online Learning Resources:
<a href="https://onlinecourses.nptel.ac.in/noc21_cs04/preview">https://onlinecourses.nptel.ac.in/noc21_cs04/preview</a>



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	OPERATING SYSTEMS		L	T	P	C
20A05402T	(Common to CSE, IT, CSE( DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)		3	0	0	3
Pre-requisite	Basics of CO and DBMS	Semester	IV			
<b>Course Objectives:</b>						
<p>The course is designed to</p> <ul style="list-style-type: none"> <li>• Understand basic concepts and functions of operating systems</li> <li>• Understand the processes, threads and scheduling algorithms.</li> <li>• Provide good insight on various memory management techniques</li> <li>• Expose the students with different techniques of handling deadlocks</li> <li>• Explore the concept of file-system and its implementation issues</li> <li>• Familiarize with the basics of the Linux operating system</li> <li>• Implement various schemes for achieving system protection and security</li> </ul>						
<b>Course Outcomes (CO):</b>						
<p>After completion of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Realize how applications interact with the operating system</li> <li>• Analyze the functioning of a kernel in an Operating system.</li> <li>• Summarize resource management in operating systems</li> <li>• Analyze various scheduling algorithms</li> <li>• Examine concurrency mechanism in Operating Systems</li> <li>• Apply memory management techniques in the design of operating systems</li> <li>• Understand the functionality of the file system</li> <li>• Compare and contrast memory management techniques.</li> <li>• Understand deadlock prevention and avoidance.</li> <li>• Perform administrative tasks on Linux based systems.</li> </ul>						
UNIT - I	<b>Operating Systems Overview, System Structures</b>		8Hrs			
<p><b>Operating Systems Overview:</b> Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems  <b>System Structures:</b> Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.</p>						
UNIT - II	<b>Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication</b>		10Hrs			
<p><b>Process Concept:</b> Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.  <b>Multithreaded Programming:</b> Multithreading models, Thread libraries, Threading issues, Examples.  <b>Process Scheduling:</b> Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.  <b>Inter-process Communication:</b> Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.</p>						
UNIT - III	<b>Memory-Management Strategies, Virtual Memory Management</b>		Lecture 8Hrs			
<p><b>Memory-Management Strategies:</b> Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.</p>						



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

<b>Virtual Memory Management:</b> Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.		
UNIT - IV	<b>Deadlocks, File Systems</b>	Lecture 9Hrs
<p><b>Deadlocks:</b> Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.</p> <p><b>File Systems:</b> Files, Directories, File system implementation, management and optimization.</p> <p>Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.</p>		
UNIT - V	<b>System Protection, System Security</b>	Lecture 8Hrs
<p><b>System Protection:</b> Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.</p> <p><b>System Security:</b> Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.</p> <p>Case Studies: Linux, Microsoft Windows.</p>		
Textbooks:		
<ol style="list-style-type: none"> <li>1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.</li> <li>2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.</li> </ol> <p>(Topics: Inter-process Communication and File systems.)</p>		
Reference Books:		
<ol style="list-style-type: none"> <li>1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.</li> <li>2. Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.</li> <li>3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009</li> <li>4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004</li> </ol>		
Online Learning Resources:		
<p><a href="https://nptel.ac.in/courses/106/106/106106144/">https://nptel.ac.in/courses/106/106/106106144/</a></p> <p><a href="http://peterindia.net/OperatingSystems.html">http://peterindia.net/OperatingSystems.html</a></p>		





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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	Software Engineering (Common to CSE, IT, CSE( DS), CSE (IoT))	L	T	P	C
20A05403T		3	0	0	3
Pre-requisite	Semester	IV			
Course Objectives:					
<ul style="list-style-type: none"> <li>• To learn the basic concepts of software engineering and life cycle models</li> <li>• To explore the issues in software requirements specification and enable to write SRS documents for software development problems</li> <li>• To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems</li> <li>• To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing</li> <li>• To reveal the basic concepts in software project management</li> </ul>					
Course Outcomes (CO):					
After completion of the course, students will be able to					
<ul style="list-style-type: none"> <li>• Obtain basic software life cycle activity skills.</li> <li>• Design software requirements specifications for given problems.</li> <li>• Implement structure, object oriented analysis and design for given problems.</li> <li>• Design test cases for given problems.</li> <li>• Apply quality management concepts at the application level.</li> </ul>					
UNIT - I	<b>Basic concepts in software engineering and software project management</b>	Lecture 8Hrs			
Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.					
UNIT - II	<b>Requirements analysis and specification</b>	Lecture 8Hrs			
The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification.					
UNIT - III	<b>Software Design</b>	Lecture 9Hrs			
Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.					
UNIT - IV	<b>Coding and Testing</b>	Lecture 9Hrs			
Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.					
UNIT - V	<b>Software quality, reliability, and other issues</b>	Lecture 9Hrs			
Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.					
Textbooks:					



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

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| <ol style="list-style-type: none"><li>1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.</li><li>2. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.</li></ol> |
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Reference Books:
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| <ol style="list-style-type: none"><li>1. Somerville, “Software Engineering”, Pearson 2.</li><li>2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.</li><li>3. JalotePankaj, “An integrated approach to Software Engineering”, Narosa</li></ol> |
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Online Learning Resources:
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<p><a href="https://nptel.ac.in/courses/106/105/106105182/">https://nptel.ac.in/courses/106/105/106105182/</a> <a href="http://peterindia.net/SoftwareDevelopment.html">http://peterindia.net/SoftwareDevelopment.html</a></p>
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to All branches of Engineering)		L	T	P	C
20A52301			3	0	0	3
Pre-requisite	NIL	Semester	III			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>To inculcate the basic knowledge of micro economics and financial accounting</li> <li>To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost</li> <li>To Know the Various types of market structure and pricing methods and strategy</li> <li>To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.</li> <li>To provide fundamental skills on accounting and to explain the process of preparing financial statements</li> </ul>						
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li>Define the concepts related to Managerial Economics, financial accounting and management.</li> <li>Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets</li> <li>Apply the Concept of Production cost and revenues for effective Business decision</li> <li>Analyze how to invest their capital and maximize returns</li> <li>Evaluate the capital budgeting techniques</li> <li>Develop the accounting statements and evaluate the financial performance of business entity.</li> </ul>						
UNIT - I	<b>Managerial Economics</b>					
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.						
UNIT - II	<b>Production and Cost Analysis</b>					
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.						
UNIT - III	<b>Business Organizations and Markets</b>					
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies						
UNIT - IV	<b>Capital Budgeting</b>					
Introduction – Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)						
UNIT - V	<b>Financial Accounting and Analysis</b>					



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**Computer Science & Engineering (Internet of Things)**

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis* - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

**Textbooks:**

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

**Reference Books:**

1. Ahuja HI Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

**Online Learning Resources:**

<https://www.slideshare.net/123ps/managerial-economics-ppt>  
<https://www.slideshare.net/rossanz/production-and-cost-45827016>  
<https://www.slideshare.net/darkyla/business-organizations-19917607>  
<https://www.slideshare.net/balarajbl/market-and-classification-of-market>  
<https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396>  
<https://www.slideshare.net/ashu1983/financial-accounting>



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	ORGANISATIONAL BEHAVIOUR (Common to All branches of Engineering)		L	T	P	C
20A52302			3	0	0	3
<b>Pre-requisite</b>	<b>NIL</b>	<b>Semester</b>	<b>III</b>			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>• To enable student's comprehension of organizational behavior</li> <li>• To offer knowledge to students on self-motivation, leadership and management</li> <li>• To facilitate them to become powerful leaders</li> <li>• To Impart knowledge about group dynamics</li> <li>• To make them understand the importance of change and development</li> </ul>						
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li>• Define the Organizational Behaviour, its nature and scope.</li> <li>• Understand the nature and concept of Organizational behaviour</li> <li>• Apply theories of motivation to analyse the performance problems</li> <li>• Analyse the different theories of leadership</li> <li>• Evaluate group dynamics</li> <li>• Develop as powerful leader</li> </ul>						
<b>UNIT - I</b>	<b>Introduction to Organizational Behavior</b>					
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.						
<b>UNIT - II</b>	<b>Motivation and Leading</b>					
Theories of Motivation- Maslow's Hierarchy of Needs - Herzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Clelland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer's ERG theory .						
<b>UNIT - III</b>	<b>Organizational Culture</b>					
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader- Women and Corporate leadership.						
<b>UNIT - IV</b>	<b>Group Dynamics</b>					
Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution						
<b>UNIT - V</b>	<b>Organizational Change and Development</b>					
Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development						
<b>Textbooks:</b>						
1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011 2. P Subba Ran, Organisational Behaviour, Himalya Publishing House 2017						
<b>Reference Books:</b>						
<ul style="list-style-type: none"> <li>▪ McShane, Organizational Behaviour, TMH 2009</li> <li>▪ Nelson, Organisational Behaviour, Thomson, 2009.</li> <li>▪ Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.</li> <li>▪ Aswathappa, Organisational Behaviour, Himalaya, 2009</li> </ul>						
<b>Online Learning Resources:</b>						
<a href="http://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714">http://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714</a> <a href="https://www.slideshare.net/harshrastogi1/group-dynamics-159412405">https://www.slideshare.net/harshrastogi1/group-dynamics-159412405</a> <a href="https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951">https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951</a>						



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	Business Environment (Common to All branches of Engineering)		L	T	P	C
20A52303			3	0	0	3
Pre-requisite	NIL	Semester	III			
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>• To make the student to understand about the business environment</li> <li>• To enable them in knowing the importance of fiscal and monetary policy</li> <li>• To facilitate them in understanding the export policy of the country</li> <li>• To Impart knowledge about the functioning and role of WTO</li> <li>• To Encourage the student in knowing the structure of stock markets</li> </ul>						
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li>• Define Business Environment and its Importance.</li> <li>• Understand various types of business environment.</li> <li>• Apply the knowledge of Money markets in future investment</li> <li>• Analyse India's Trade Policy</li> <li>• Evaluate fiscal and monetary policy</li> <li>• Develop a personal synthesis and approach for identifying business opportunities</li> </ul>						
UNIT - I	<b>Overview of Business Environment</b>					
Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal & External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis& Characteristics of business.						
UNIT - II	<b>Fiscal &amp; Monetary Policy</b>					
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.						
UNIT - III	<b>India's Trade Policy</b>					
Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.						
UNIT - IV	<b>World Trade Organization</b>					
Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.						
UNIT - V	<b>Money Markets and Capital Markets</b>					
Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.						
<b>Textbooks:</b>						
1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.						



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

**Reference Books:**

- 1.K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
- 4.E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

**Online Learning Resources:**

- <https://www.slideshare.net/ShompaDhali/business-environment-53111245>
- <https://www.slideshare.net/rbalsells/fiscal-policy-ppt>
- <https://www.slideshare.net/aguness/monetary-policy-presentationppt>
- <https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982>
- <https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt>
- <https://www.slideshare.net/viking2690/wto-ppt-60260883>
- <https://www.slideshare.net/prateeknepal3/ppt-mo>



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	Database Management Systems Laboratory (Common to CSE, IT, CSE( DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)	L	T	P	C												
20A05401P		0	0	3	1.5												
<b>Pre-requisite</b>		<b>Semester</b>		<b>IV</b>													
<b>Course Objectives:</b>																	
<ul style="list-style-type: none"> <li>• To implement the basic knowledge of SQL queries and relational algebra.</li> <li>• To construct database models for different database applications.</li> <li>• To apply normalization techniques for refining of databases.</li> <li>• To practice various triggers, procedures, and cursors using PL/SQL.</li> <li>• To design and implementation of a database for an organization</li> </ul>																	
<b>Course Outcomes (CO):</b>																	
After completion of the course, students will be able to <ul style="list-style-type: none"> <li>• Design database for any real world problem</li> <li>• Implement PL/SQL programs</li> <li>• Define SQL queries</li> <li>• Decide the constraints</li> <li>• Investigate for data inconsistency</li> </ul>																	
<b>List of Experiments:</b>																	
<b>Week-1: CREATION OF TABLES</b>																	
1. Create a table called Employee with the following structure.																	
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Empno</td> <td>Number</td> </tr> <tr> <td>Ename</td> <td>Varchar2(20)</td> </tr> <tr> <td>Job</td> <td>Varchar2(20)</td> </tr> <tr> <td>Mgr</td> <td>Number</td> </tr> <tr> <td>Sal</td> <td>Number</td> </tr> </tbody> </table>				Name	Type	Empno	Number	Ename	Varchar2(20)	Job	Varchar2(20)	Mgr	Number	Sal	Number
Name	Type																
Empno	Number																
Ename	Varchar2(20)																
Job	Varchar2(20)																
Mgr	Number																
Sal	Number																
a. Add a column commission with domain to the Employee table. b. Insert any five records into the table. c. Update the column details of job d. Rename the column of Employ table using alter command. e. Delete the employee whose empno is 19.																	
2. Create department table with the following structure.																	
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Name</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Deptno</td> <td>Number</td> </tr> <tr> <td>Deptname</td> <td>Varchar2(20)</td> </tr> <tr> <td>location</td> <td>Varchar2(20)</td> </tr> </tbody> </table>				Name	Type	Deptno	Number	Deptname	Varchar2(20)	location	Varchar2(20)				
Name	Type																
Deptno	Number																
Deptname	Varchar2(20)																
location	Varchar2(20)																
a. Add column designation to the department table. b. Insert values into thetable. c. List the records of emp table grouped bydeptno. d. Update the record where deptno is 9. e. Delete any column data from thetable																	





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

3. Create a table called Customertable

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

- a. Insert records into thetable.
- b. Add salary column to thetable.
- c. Alter the table columndomain.
- d. Drop salary column of the customertable.
- e. Delete the rows of customer table whose ust\_city is 'hyd'.
- f. Create a table called branchtable.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.

- a. Add and drop a column to the branch table.
- b. Insert values to the table.
- c. Update the branch name column
- d. Delete any two columns from the table

5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

- a. Add column age to the sailor table.
- b. Insert values into the sailor table.
- c. Delete the row with rating>8.
- d. Update the column details of sailor.
- e. Insert null values into the table.

6. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

- a. Insert values into the reservestable.
- b. Add column time to the reservestable.
- c. Alter the column day data type todate.
- d. Drop the column time in thetable.
- e. Delete the row of the table with somecondition.

**Week-2: QUERIES USING DDL AND DML**



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

1.
  - a. Create a user and grant all permissions to the user.
  - b. Insert the any three records in the employee table and use rollback. Check the result.
  - c. Add primary key constraint and not null constraint to the employee table.
  - d. Insert null values to the employee table and verify the result.
2.
  - a. Create a user and grant all permissions to the user.
  - b. Insert values in the department table and use commit.
  - c. Add constraints like unique and not null to the department table.
  - d. Insert repeated values and null values into the table.
3.
  - a. Create a user and grant all permissions to the user.
  - b. Insert values into the table and use commit.
  - c. Delete any three records in the department table and use rollback.
  - d. Add constraint primary key and foreign key to the table.
4.
  - a. Create a user and grant all permissions to the user.
  - b. Insert records in the sailor table and use commit.
  - c. Add save point after insertion of records and verify save point.
  - d. Add constraints not null and primary key to the sailor table.
5.
  - a. Create a user and grant all permissions to the user.
  - b. Use revoke command to remove user permissions.
  - c. Change password of the user created.
  - d. Add constraint foreign key and not null.
6.
  - a. Create a user and grant all permissions to the user.
  - b. Update the table reserves and use savepoint and rollback.
  - c. Add constraint primary key, foreign key and not null to the reserves table
  - d. Delete constraint not null to the table column

**Week-3: QUERIES USING AGGREGATE FUNCTIONS**

1.
  - a. By using the group by clause, display the enames who belongs to deptno 10 along with average salary.
  - b. Display lowest paid employee details under each department.
  - c. Display number of employees working in each department and their department number.
  - d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname for each row, do the required thing specified above.
  - e. List all employees which start with either B or C.
  - f. Display only these ename of employees where the maximum salary is greater than or equal to 5000.
2.
  - a. Calculate the average salary for each different job.
  - b. Show the average salary of each job excluding manager.
  - c. Show the average salary for all departments employing more than three people.
  - d. Display employees who earn more than the lowest salary in department 30
  - e. Show that value returned by sign (n) function.
  - f. How many days between day of birth to current date
3.
  - a. Show that two substring as single string.
  - b. List all employee names, salary and 15% rise in salary.
  - c. Display lowest paid emp details under each manager
  - d. Display the average monthly salary bill for each deptno.
  - e. Show the average salary for all departments employing more than two people.
  - f. By using the group by clause, display the eid who belongs to deptno 05 along with average salary.
4.
  - a. Count the number of employees in department 20
  - b. Find the minimum salary earned by clerk.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

- c. Find minimum, maximum, average salary of allemployees.
- d. List the minimum and maximum salaries for each jobtype.
- e. List the employee names in descendingorder.
- f. List the employee id, names in ascending order byempid.
5. a. Find the sids ,names of sailors who have reserved all boats called“INTERLAKE  
Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.
- b. Find the sname , bid and reservation date for eachreservation.
- c. Find the ages of sailors whose name begin and end with B and has at least 3characters.
- d. List in alphabetic order all sailors who have reserved redboat.
- e. Find the age of youngest sailor for each ratinglevel.
6. a. List the Vendors who have delivered products within 6 months from orderdate.
- b. Display the Vendor details who have supplied both Assembled and Subparts.
- c. Display the Sub parts by grouping the Vendor type (Local or NonLocal).
- d. Display the Vendor details in ascendingorder.
- e. Display the Sub part which costs more than any of the Assembledparts.
- f. Display the second maximum cost Assembledpart

**Week-4: PROGRAMS ON PL/SQL**

1. a. Write a PL/SQL program to swaptwonumbers.
- b. Write a PL/SQL program to find the largest of threenumbers.
2. a. Write a PL/SQL program to find the total and average of 6 subjects and display thegrade.
- b. Write a PL/SQL program to find the sum of digits in a givennumber.
3. a. Write a PL/SQL program to display the number in reverseorder.
- b. Writea PL/SQLprogramtocheckwhetherthegivennumberisprimeornot.
4. a. Write a PL/SQL program to find the factorial of a givennumber.
- b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius andarea.
5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When ‘hello’ passed to the program it should display ‘Hll’ removing e and o from the worldHello).
- b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainderin words.

**Week-5: PROCEDURES AND FUNCTIONS**

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.
2. Accept year as parameter and write a Function to return the total net salary spent for a givenyear.
3. Create a function to find the factorial of a given number and hence findNCR.
4. Write a PL/SQL block o pint prime Fibonacci series using localfunctions.
5. Create a procedure to find the lucky number of a given birthdate.
6. Create function to the reverse of givennumber

**Week-6: TRIGGERS**

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and newvalues:

CUSTOMERS table:



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.  
 Passenger( Passport\_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
  - a. Write a Insert Trigger to check the Passport\_id is exactly six digits ornot.
  - b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passengerrespectively.
3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETEoccurs.
4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert orupdate.
5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete \_emp and also record user who has deleted the record and date and time ofdelete.
6. Create a transparent audit system for a table CUST\_MSTR. The system must keep track of the records that are being deleted orupdated

**Week-7:PROCEDURES**

1. Create the procedure for palindrome of givennumber.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD isfound.
3. Write the PL/SQL programs to create the procedure for factorial of givennumber.
4. Write the PL/SQL programs to create the procedure to find sum of N naturalnumber.
5. Write the PL/SQL programs to create the procedure to find Fibonacciseries.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect ornot

**Week-8: CURSORS**

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paidemployees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

master table then the record is inserted in the item mastertable.

3. Write a PL/SQL block that will display the employee details along with salary using cursors.
4. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
5. To write a Cursor to find employee with given job and deptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

**Week-9: CASE STUDY: BOOK PUBLISHING COMPANY**

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.

A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with one editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

**Week-10: CASE STUDY GENERAL HOSPITAL**

A General Hospital consists of a number of specialized wards (such as Maternity, Pediatric, Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their own GP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

**Week-11: CASE STUDY: CAR RENTAL COMPANY**

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special credit card facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.

Create the logical data model using E-R diagrams

**Week-12: CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM**

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons.) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre-requisites modules and some degree programs have compulsory modules. The database is also to contain some information about students including their numbers, names, addresses, degrees they read for, and their past performance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the data required.
2. Normalize the attributes.
3. Create the logical data model i.e., ER diagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys wherever required.
5. Insert values into the tables created (Be vigilant about Master- Slave tables).
6. Display the Students who have taken M.Sc course
7. Display the Module code and Number of Modules taught by each Lecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English' module.
10. Retrieve the Prerequisite Courses offered by every Department (with Department names).
11. Present the Lecturer ID and Name who teaches 'Mathematics'.
12. Discover the number of years a Module is taught.
13. List out all the Faculties who work for 'Statistics' Department.
14. List out the number of Modules taught by each Module Leader.
15. List out the number of Modules taught by a particular Lecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and its name).
17. Update the credits of all the prerequisite courses to 5. Delete the Module 'History' from the Module table.

**References:**

1. Ramez Elmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

**Online Learning Resources/Virtual Labs:**

<http://www.scoopworld.in>

<http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php>



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	OPERATING SYSTEMS LAB		L	T	P	C
20A05402P	(Common to CSE, IT, CSE( DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)		0	0	3	1.5
Pre-requisite	Basics of CO and DBMS	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> <li>• To familiarize students with the architecture of OS.</li> <li>• To provide necessary skills for developing and debugging CPU Scheduling algorithms.</li> <li>• To elucidate the process management and scheduling and memory management.</li> <li>• To explain the working of an OS as a resource manager, file system manager, process manager, memory manager, and page replacement tool.</li> <li>• To provide insights into system calls, file systems and deadlock handling.</li> </ul>						
Course Outcomes (CO):						
<p>After completion of the course, students will be able to</p> <ul style="list-style-type: none"> <li>• Trace different CPU Scheduling algorithms (L2).</li> <li>• Implement Bankers Algorithms to Avoid and prevent the Dead Lock (L3).</li> <li>• Evaluate Page replacement algorithms (L5).</li> <li>• Illustrate the file organization techniques (L4).</li> <li>• Illustrate shared memory process (L4).</li> <li>• Design new scheduling algorithms (L6)</li> </ul>						
List of Experiments:						
<ol style="list-style-type: none"> <li>1. Practicing of Basic UNIX Commands.</li> <li>2. Write programs using the following UNIX operating system calls Fork, exec, getpid, exit, wait, close, stat, opendir and readdir</li> <li>3. Simulate UNIX commands like cp, ls, grep, etc.,</li> <li>4. Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority</li> <li>5. Implement a dynamic priority scheduling algorithm.</li> <li>6. Assume that there are five jobs with different weights ranging from 1 to 5. Implement round robin algorithm with time slice equivalent to weight.</li> <li>7. Implement priority scheduling algorithm. While executing, no process should wait for more than 10 seconds. If the waiting time is more than 10 seconds that process has to be executed for at least 1 second before waiting again.</li> <li>8. Control the number of ports opened by the operating system with a) Semaphore b) Monitors.</li> <li>9. Simulate how parent and child processes use shared memory and address space.</li> <li>10. Simulate sleeping barber problem.</li> <li>11. Simulate dining philosopher's problem.</li> <li>12. Simulate producer-consumer problem using threads.</li> <li>13. Implement the following memory allocation methods for fixed partition a) First fit b) Worst fit c) Best fit</li> <li>14. Simulate the following page replacement algorithms a) FIFO b) LRU c) LFU etc.,</li> <li>15. Simulate Paging Technique of memory management</li> <li>16. Simulate Bankers Algorithm for Dead Lock avoidance and prevention</li> <li>17. Simulate the following file allocation strategies a) Sequential b) Indexed c) Linked</li> <li>18. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG</li> </ol>						
References:						



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

1. “Operating System Concepts”, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth Edition, John Wiley.
2. “Operating Systems: Internals and Design Principles”, Stallings, Sixth Edition–2009, Pearson Education
3. “Modern Operating Systems”, Andrew S Tanenbaum, Second Edition, PHI.
4. “Operating Systems”, S.Haldar, A.A.Aravind, Pearson Education.
5. “Principles of Operating Systems”, B.L.Stuart, Cengage learning, India Edition.2013-2014
6. “Operating Systems”, A.S.Godbole, Second Edition, TMH.
7. “An Introduction to Operating Systems”, P.C.P. Bhatt, PHI.

Online Learning Resources/Virtual Labs:

<https://www.cse.iitb.ac.in/~mythili/os/>

<http://peterindia.net/OperatingSystems.html>





**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	SOFTWARE ENGINEERING LAB	L	T	P	C
20A05403P	(Common to CSE, IT, CSE( DS), CSE (IoT))	0	0	3	1.5
Pre-requisite	Semester	IV			
Course Objectives:					
<ul style="list-style-type: none"> <li>• To learn and implement the fundamental concepts of Software Engineering.</li> <li>• To explore functional and non-functional requirements through SRS.</li> <li>• To practice the various design diagrams through the appropriate tool.</li> <li>• To learn to implement various software testing strategies.</li> </ul>					
Course Outcomes (CO):					
After completion of the course, students will be able to <ul style="list-style-type: none"> <li>• Acquaint with historical and modern software methodologies</li> <li>• Understand the phases of software projects and practice the activities of each phase</li> <li>• Practice clean coding</li> <li>• Take part in project management</li> <li>• Adopt skills such as distributed version control, unit testing, integration testing, build management, and deployment</li> </ul>					
List of Experiments:					
<ol style="list-style-type: none"> <li>1 Draw the Work Breakdown Structure for the system to be automated</li> <li>2 Schedule all the activities and sub-activities Using the PERT/CPM charts</li> <li>3 Define use cases and represent them in use-case document for all the stakeholders of the system to be automated</li> <li>4 Identify and analyze all the possible risks and its risk mitigation plan for the system to be automated</li> <li>5 Diagnose any risk using Ishikawa Diagram (Can be called as Fish Bone Diagram or Cause&amp; Effect Diagram)</li> <li>6 Define Complete Project plan for the system to be automated using Microsoft Project Tool</li> <li>7 Define the Features, Vision, Business objectives, Business rules and stakeholders in the vision document</li> <li>8 Define the functional and non-functional requirements of the system to be automated by using Use cases and document in SRS document</li> <li>9 Define the following traceability matrices :               <ol style="list-style-type: none"> <li>1. Use case Vs. Features</li> <li>2. Functional requirements Vs. Usecases</li> </ol> </li> <li>10 Estimate the effort using the following methods for the system to be automated:               <ol style="list-style-type: none"> <li>1. Function point metric</li> <li>2. Usecase point metric</li> </ol> </li> <li>11 Develop a tool which can be used for quantification of all the non-functional requirements</li> <li>12 Write C/C++/Java/Python program for classifying the various types of coupling.</li> <li>13 Write a C/C++/Java/Python program for classifying the various types of cohesion.</li> <li>14 Write a C/C++/Java/Python program for object oriented metrics for design proposed by Chidamber and Kremer. (Popularly called CK metrics)</li> <li>15 Convert the DFD into appropriate architecture styles.</li> <li>16 Draw a complete class diagram and object diagrams using Rational tools</li> <li>17 Define the design activities along with necessary artifacts using Design Document.</li> <li>18 Reverse Engineer any object-oriented code to an appropriate class and object diagrams.</li> <li>19 Test a piece of code that executes a specific functionality in the code to be tested and asserts a certain behavior or state using Junit.</li> <li>20 Test the percentage of code to be tested by unit test using any code coverage tools</li> <li>21 Define appropriate metrics for at least 3 quality attributes for any software application of your interest.</li> </ol>					



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

22	Define a complete call graph for any C/C++ code. (Note: The student may use any tool that generates call graph for source code)
<b>References:</b>	
<ol style="list-style-type: none"><li>1. Software Engineering? A Practitioner's Approach, Roger S. Pressman, 1996, MGH.</li><li>2. Software Engineering by Ian Sommerville, Pearson Edu, 5th edition, 1999</li><li>3. An Integrated Approach to software engineering by Pankaj Jalote , 1991 Narosa</li></ol>	
<b>Online Learning Resources/Virtual Labs:</b>	
<a href="http://vlabs.iitkgp.ac.in/se/">http://vlabs.iitkgp.ac.in/se/</a>	



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	Python Programming for IoT		L	T	P	C
20A35401			1	0	2	2
Pre-requisite	Python Programming Basics	Semester	IV			
Course Objectives:						
<ul style="list-style-type: none"> <li>Understand the architecture of Internet of Things and connected world.</li> <li>Explore on use of various hardware and sensing technologies to build IoT applications.</li> <li>Illustrate the real time IoT applications to make smart world.</li> <li>Understand the available cloud services and communication API's for developing smart cities</li> </ul>						
Course Outcomes (CO):						
<p>After completion of the course, students will be able to</p> <ul style="list-style-type: none"> <li>Understand the concept of Internet of Things and connected world.</li> <li>Explore on use of various hardware and sensing technologies to build IoT applications</li> <li>Illustrate the architecture of Internet of Things and python.</li> <li>Understand the working with python on intel galileo gen.</li> <li>Explore on Interacting with digital outputs with python</li> </ul>						
<b>List of Experiments:</b>						
<b>Module-1: Understanding and Setting up the Base IoT Hardware</b>						
<ul style="list-style-type: none"> <li>Understanding the Intel Galileo Gen 2 board and its components</li> <li>Recognizing the Input/Output and the Arduino 1.0 pinout</li> <li>Recognizing additional expansion and connectivity capabilities</li> <li>Understanding the buttons and the LEDs</li> <li>Checking and upgrading the board's firmware</li> </ul>						
<b>Module-2: Working with Python on Intel Galileo Gen 2</b>						
<ul style="list-style-type: none"> <li>Setting up the board to work with Python as the programming language</li> <li>Retrieving the board's assigned IP address</li> <li>Connecting to the board's operating system</li> <li>Installing and upgrading the necessary libraries to interact with the board</li> <li>Installing pip and additional libraries</li> <li>Invoking the Python interpreter</li> </ul>						
<b>Module-3: Interacting with Digital Outputs with Python</b>						
<ul style="list-style-type: none"> <li>Turning on and off an onboard component</li> <li>Prototyping with breadboards</li> <li>Working with schematics to wire digital outputs</li> <li>Counting from 1 to 9 with LEDs, Python code and the mraa library</li> <li>Taking advantage of object-oriented code to control digital outputs</li> <li>Improving our object-oriented code to provide new features</li> <li>Isolating the pin numbers to improve wirings</li> <li>Controlling digital outputs with the wiring-x86 library</li> </ul>						
<b>Module-4: Working with a RESTful API and Pulse Width Modulation</b>						



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

- Printing numbers in LEDs with a RESTful API
- Composing and sending HTTP requests
- Wiring pins with PWM capabilities
- Using PWM to generate analog values
- Generating analog values via HTTP requests
- Preparing the RESTful API for Web application requirements
- Using PWM plus a RESTful API to set colors for an RGB LED
- Controlling PWM with the wiring-x86 library

**Module-5: Working with Digital Inputs, Polling and Interrupts**

- Understanding pushbuttons and pullup resistors
- Wiring digital input pins with pushbuttons
- Reading pushbutton statuses with digital inputs and the mraa library
- Reading pushbutton statuses and running a RESTful API
- Reading digital inputs with the wiring-x86 library
- Using interrupts to detect pressed pushbuttons

**Module-6: Working with Analog Inputs and Local Storage**

- Understanding the analog inputs
- Wiring an analog input pin with a voltage source
- Measuring voltage with analog inputs and the mraa library
- Wiring a photoresistor to an analog input pin
- Determining the darkness level with analog inputs and the mraa library
- Firing actions when the environment light changes
- Controlling analog inputs with the wiring-x86 library
- Logging to files in the local storage
- Working with USB attached storage

**Module-7: Retrieving Data from the Real World with Sensors**

- Understanding sensors and their connection types
- Working with accelerometers
- Wiring an analog accelerometer to the analog input pins
- Measuring three axis acceleration with an analog accelerometer
- Wiring a digital accelerometer to the I2C bus
- Measuring three axis acceleration with a digital accelerometer
- Using the I2C bus to control a digital accelerometer with themraa library
- Wiring an analog temperature sensor
- Measuring ambient temperature with an analog sensor
- Wiring a digital temperature and humidity sensor to the I2C bus
- Measuring temperature and humidity with a digital sensor

**Module-8: Displaying Information and Performing Actions**

- Understanding LCD displays and their connection types
- Wiring an LCD RGB backlight to the I2C bus
- Displaying text on an LCD display



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

- Wiring an OLED dot matrix to the I2C bus
- Displaying text on an OLED display
- Wiring a servo motor
- Positioning a shaft to indicate a value with a servo motor

**Case Study-1: Smart Traffic Management System Using IoT**

Waiting in a traffic jam has always been a bad experience for everyone. In this case study, you will develop a smart traffic management system. The traffic will be controlled based on the number of vehicles waiting. The lane with a greater number of vehicles will be allowed to move first.

Source: <https://www.youtube.com/watch?v=5z2t0IfTDag>

**References:**

1. Gaston C. Hillar Gaston C Hillar , “Internet of Things with Python”, ISBN 978-1-78588-138-1
2. [https://www.tutorialspoint.com/internet\\_of\\_things/index.htm](https://www.tutorialspoint.com/internet_of_things/index.htm)
3. <https://docs.oracle.com/en/cloud/paas/iot-cloud/tutorial-qs-iot-python/index.html>



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

Course Code	Design Thinking for Innovation (Common to All branches of Engineering)		L	T	P	C
20A99401			2	1	0	0
Pre-requisite	NIL	Semester	IV			
<b>Course Objectives:</b>						
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.						
<b>Course Outcomes (CO):</b>						
<ul style="list-style-type: none"> <li>● Define the concepts related to design thinking.</li> <li>● Explain the fundamentals of Design Thinking and innovation</li> <li>● Apply the design thinking techniques for solving problems in various sectors.</li> <li>● Analyse to work in a multidisciplinary environment</li> <li>● Evaluate the value of creativity</li> <li>● Formulate specific problem statements of real time issues</li> </ul>						
<b>UNIT - I</b>	<b>Introduction to Design Thinking</b>					<b>10 Hrs</b>
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.						
<b>UNIT - II</b>	<b>Design Thinking Process</b>					<b>10 Hrs</b>
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development						
<b>Activity:</b> Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.						
<b>UNIT - III</b>	<b>Innovation</b>					<b>8 Hrs</b>
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.						
<b>Activity:</b> Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.						
<b>UNIT - IV</b>	<b>Product Design</b>					<b>8 Hrs</b>
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.						
<b>Activity:</b> Importance of modelling, how to set specifications, Explaining their own product design.						
<b>UNIT - V</b>	<b>Design Thinking in Business Processes</b>					<b>10 Hrs</b>
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.						
<b>Activity:</b> How to market our own product, About maintenance, Reliability and plan for startup.						



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., ACT No.30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

**Textbooks:**

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.

**Reference Books:**

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

**Online Learning Resources:**

<https://nptel.ac.in/courses/110/106/110106124/>  
<https://nptel.ac.in/courses/109/104/109104109/>  
[https://swayam.gov.in/nd1\\_noc19\\_mg60/preview](https://swayam.gov.in/nd1_noc19_mg60/preview)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

**COMMUNITY SERVICE PROJECT**

**.....Experiential learning through community engagement**

**Introduction**

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

**Objective**

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

**Implementation of Community Service Project**

- Every student should put in a 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty incharge.





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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

**Procedure**

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

**EXPECTED OUTCOMES**

**BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS**



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**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering (Internet of Things)**

**Learning Outcomes**

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

**Personal Outcomes**

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

**Social Outcomes**

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

**Career Development**

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

**Relationship with the Institution**

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

**BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS**

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES**

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

**BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY**

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.



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**Computer Science & Engineering (Internet of Things)**

**SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT**

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

**For Engineering Students**

1. **Water facilities and drinking water availability**
2. **Health and hygiene**
3. **Stress levels and coping mechanisms**
4. **Health intervention programmes**
5. **Horticulture**
6. **Herbal plants**
7. **Botanical survey**
8. **Zoological survey**
9. **Marine products**
10. **Aqua culture**
11. **Inland fisheries**
12. **Animals and species**
13. **Nutrition**
14. **Traditional health care methods**
15. **Food habits**
16. **Air pollution**
17. **Water pollution**
18. **Plantation**
19. **Soil protection**
20. **Renewable energy**
21. **Plant diseases**
22. **Yoga awareness and practice**
23. **Health care awareness programmes and their impact**
24. **Use of chemicals on fruits and vegetables**
25. **Organic farming**
26. **Crop rotation**
27. **Floury culture**
28. **Access to safe drinking water**
29. **Geographical survey**
30. **Geological survey**
31. **Sericulture**
32. **Study of species**



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ANANTHAPURAMU – 515 002 (A.P) INDIA

**Computer Science & Engineering (Internet of Things)**

33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

**Programmes for School Children**

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

**Programmes for Women Empowerment**

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

**General Camps**

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

**Programmes for Youth Empowerment**

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco



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**Computer Science & Engineering (Internet of Things)**

4. Awareness on Competitive Examinations

5. Personality Development

**Common Programmes**

1. Awareness on RTI

2. Health intervention programmes

3. Yoga

4. Tree plantation

5. Programmes in consonance with the Govt. Departments like –

- i. Agriculture
- ii. Health
- iii. Marketing and Cooperation
- iv. Animal Husbandry
- v. Horticulture
- vi. Fisheries
- vii. Sericulture
- viii. Revenue and Survey
- ix. Natural Disaster Management
- x. Irrigation
- xi. Law & Order
- xii. Excise and Prohibition
- xiii. Mines and Geology
- xiv. Energy

**Role of Students:**

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

**Timeline for the Community Service Project Activity**

**Duration: 8 weeks**

**1. Preliminary Survey (One Week)**

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.



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- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

**2. Community Awareness Campaigns (One Week)**

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

**3. Community Immersion Programme (Three Weeks)**

**Along with the Community Awareness Programmes**, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

**4. Community Exit Report (One Week)**

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.