DTE Code: 4151 www.tgpcet.com

TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Approved by AICTE, New Delhi and Govt. of Maharashtra | Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

AN AUTONOMOUS INSTITUTE

DEPARTMENT OF INFORMATION TECHNOLOGY

B. Tech in Information Technology

As Per NEP 2020

(Version 3)

Scheme of Instruction & Syllabus

IV Semester

From AY. 2026-27

GAIKWAD-PATIL
GROUP OF INSTITUTIONS

Vision Mission of Institution

Vision - To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission -

- To strive for rearing standard and stature of the students by practicing high standards of Professional ethics, transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating Knowledge and profession as work practices.

Vision Mission of Department

Vision - To emerge as a learning hub and centre of excellence in the domain of Information Technology

Mission -

- To impart quality technical education through effective teaching learning process.
- To provide a platform to address societal issues as well as challenges faced by IT industries.
- To foster a culture of research and impart innovative and entrepreneurial skills in the field of IT.
- To ensure overall development of students and staff by inculcating knowledge and professional ethics as a part of lifelong learning.

Program Specific Outcomes

PSO1: Develop and apply logical and programing skills to solve real-world challenges.

PSO2: Utilize knowledge of software engineering and network techniques to design and implement efficient solutions.

PSO3: Leverage computing knowledge to conduct research and adopt emerging technologies in the development of IT systems.

Program Educational Outcomes

PEO 1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in IT Sector.

PEO 2: Apply field knowledge, research and professional practices to meet the requirements of industries.

PEO3:Imbibe lifelong learning practices and entrepreneurship skills in tune with emerging technologies.

PEO 4: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per New NEP 2020)

Semester- IV

Sr. No	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	IV	PCC	IT	BIT42401	Operating System	T	3	-	3	03	30	10	60	3 Hrs.	**100**
2		PCC	IT	BIT42402	Design and Analysis of Algorithms	T	3	-	3	03	30	10	60	3 Hrs.	**100**
3		MDM	SH	BSH42401	Discrete mathematics & Graph Theory	T	2	-	2	02	14	6	30	2 Hrs.	**50**
4		OEC	IT	BIT42413	Open Elective-II (Artificial Intelligence)	T	2	-	2	02	14	6	30	2 Hrs.	**50**
5		VSEC	IT	BIT42403	Object Oriented Programming with C++	P	-	2	2	01	-	25	25	-	**50**
6		AEC	SH	BSH42404	Leadership and Team Dynamics	P	-	4	4	02	-	50	50	-	**100**
7		HSSM	MBA	BBA42402	Innovation and Entrepreneurship	T	2	-	2	02	14	6	30	2 Hrs.	**50**
8		VEC	SH	BSH42403	Human Value for Professional Society	T	2	-	2	02	14	6	30	2 Hrs.	**50**
9		PCC	IT	BIT42404	Operating System using Python Lab (Idea Lab)	P	-	2	2	01	-	25	25	-	**50**
10		PCC	IT	BIT42405	Design and Analysis of Algorithms Lab	P	-	2	2	01	-	25	25	-	**50**
11		AEC	BSH	BSH42XX	Liberal Learning Module-IV	P	-	2	2	01	50	-	-	-	**50**
12		PRO	IT	BIT42406	Micro Project	P	-	2	2	01	-	25	25	-	**50**
Total							**14**	**14**	**28**	**21**	**166**	**194**	**390**	**14 Hrs**	**750**

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC/PEC (Programme Core courses	VSEC (Skill Course)	Multidisciplinary Courses		Humanities Social Science & Management				Experiential Learning Courses				CC (Co-Curricular Courses)
				MDM (Multidisciplinary minor	OE(Open Elective)	AEC (Ability Enhancement Course)	IKS(Indian Knowledge System)	VEC(Value education Course	Management Course	Research Methodology	Field Project	Project	Internship /OJT	
Credits	-	08	02	02	02	02	-	02	02	-	-	-	-	-
Cumulative Sum	16 / 13	20	06	04	06	06	02	02	04	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:64+21=85

Head of Dept. Information Technology, Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur	Vice Principal Dr. Ganesh Wakte Vicep Principal TGPCET, Nagpur	Patel	Dr. Premanand Naktode Principal TGPCET, Nagpur	October, 2026	2.00	Applicable for AY 2024-25 Onwards
Chairperson	Vice-Principal/ Dean Academics	Director Administration	Principal	Date of Release	Version	

Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Second Year (Semester-IV) B. Tech. Information Technology

BIT42401: Operating System

Teaching Scheme		Examination Scheme	
Theory	**3 Hrs/week**	CT-I	15 Marks
Tutorial	**-**	CT-II	15 Marks
Total Credits	**3**	CA	10 Marks
		ESE	60 Marks
		Total	100 Marks
		Duration of ESE: 3Hrs	

Course Objectives: Student will able to

1.	Understand the core functions and structure of an operating system.
2.	Understand the principles of file management, including file system structure and access methods.
3.	Apply various page replacement algorithms (Optimal, FIFO, LRU) for efficient memory management in virtual memory systems.
4.	Apply synchronization techniques such as semaphores and monitors to solve concurrency issues.
5.	Understand the definition of deadlock and the necessary and sufficient conditions for its occurrence in operating systems.

Course Contents

Unit I	**Introduction:** What is an Operating System (OS), structure of OS, types of OS: time sharing, real-time, multiprocessor (asynchronous and synchronous), multiprogramming (loosely coupled, tightly coupled), distributed, client-server, peer-to-peer, mobile OS, embedded OS, IoT OS; services of OS, user view and machine view of OS, system calls, spooling and buffering.
Unit II	**File Management and Process Management:** File Management: File concept, file attributes, file operations, file system structure, file system implementation, file access methods, disk scheduling algorithms, file protection, free space management on disk. **Process Management:** Process concept, process scheduling, operations on process, interprocess communication, communication between client-server, multithreaded model, process scheduling criteria, scheduling algorithms, multicore scheduling**.**
Unit III	**Memory Management and Virtual Memory:** Memory Management: Basic concept, logical and physical address map, memory allocation: contiguous memory allocation (fixed and variable partition), internal and external fragmentation and compaction; paging: principle of operation, page allocation, hardware support for paging, protection and sharing, disadvantages of paging.

	Virtual Memory: Basics of virtual memory, hardware and control structures, locality of reference, page fault, working set, dirty page/dirty bit, demand paging, page replacement algorithms: Optimal, First In First Out (FIFO) and Least Recently Used (LRU).
Unit IV	**Process Synchronization** Critical section problem, semaphores, classic problems: Dining Philosophers, producer-consumer, readers-writers, bounded buffer; monitors, synchronization examples.
Unit V	**Deadlocks and Contemporary Operating Systems** **Deadlocks**: Definition, necessary and sufficient conditions for deadlock, deadlock prevention, deadlock avoidance deadlock detection and recovery. **Contemporary Concepts**: Virtualization, containerization, cloud computing environments, case studies: Linux, Windows and Android.
Text Books	
T.1	Modern Operating Systems – A. S. Tanenbaum, Pearson Education
T.2	Operating System Concepts by Silberchatz et al, 5th edition, 1998, Addison-Wesley.
Reference Books	
R.1	Operating Systems by Mandrik & Donovan, TMH
R.2	Operating Systems concepts and Design – Milan Milenkovic, Tata McGraw Hill
Useful Links	
1	https://csc-knu.github.io/sys-prog/books/Andrew%20S.%20Tanenbaum%20-%20Modern%20Operating%20Systems.pdf
2	https://www.geeksforgeeks.org/operating-systems/

	Course Outcomes	CL	Class Sessions
CO1	Explain OS structure, services, types and system calls.	2	9
CO2	Illustrate file management, disk scheduling and process scheduling, including multicore.	2	9
CO3	Describe paging and page replacement algorithms to manage memory.	2	9
CO4	Outline semaphores and monitors to process synchronization problems.	2	9
CO5	Apply deadlock handling methods and describe virtualization, containers and cloud using case studies of Linux, Windows and Android.	5	9

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Second Year (Semester-IV) B. Tech. Information Technology

BIT42402: -Design Analysis of Algorithms

Teaching Scheme	
Theory	**3 Hrs/week**
Tutorial	**-**
Total Credits	**3**

Examination Scheme	
CT-I	15 Marks
CT-II	15 Marks
CA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 3Hrs	

Course Objectives:

1.	To Understand the foundational concepts, characteristics, and performance analysis of algorithms.
2.	To explore algorithm design paradigms using algorithms.
3.	To classify classical algorithms for appropriate strategies and recurrence relations.
4.	To Develop efficient solutions for complex problems through structured algorithmic techniques.
5.	To examine the complexity classes, and understand non-deterministic algorithms.

Course Contents

Unit I	**Analysis of Algorithm** Characteristics of algorithm, Principles of designing algorithm, Asymptotic notations, Best, average and worst-case behavior, Time & Space Complexity of Algorithm, Recurrences- Substitution method, recursion method, recurrence tree method, master method, Fundamental algorithmic Strategies.
Unit II	**Divide and Conquer Strategy** Basic Strategy, Analysis of Quick Sort, Quick sort Randomized Version, Analysis of Merge Sort, Strassen's Matrix Multiplication, Maximum Array Problem **Greedy Method** Basic Strategy, Fractional Knapsack Problem, Huffman Coding, Minimum Cost Spanning Tree: Kruskal's and Prim's Algorithm
Unit III	**Dynamic Programming** Basic strategy, Floyd War shall Algorithm, Multistage graphs, Optimal Binary Search Tree, traveling salesman problem, Longest Common Subsequence problem, 0/1 Knapsack Problem, Chained Matrix Multiplication.
Unit IV	**Backtracking** Basic strategy, n queen problem, Sum of Subset, Graph Coloring, Hamilton Cycle **Branch and Bound Method** General method, Traveling salesman problem, 0/1 knapsack problem, LC branch and bound solution, FIFO Brach and Bound solution, LIFO Brach and Bound solution.

Unit V	**NP Problems** NP-Hard and NP Complete problems: Basic concepts, Non Deterministic algorithms, NP-Hard and NP Complete classes, NP- Hard problems, Cook's Theorem
Text Books	
T.1	Design & Analysis of Computer Algorithms by Aho, Pearson education. Horowitz, Sa Rajsekharam
T.2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall, 2010.
Reference Books	
R.1	Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, "The Design and Analysis of Computer Algorithms", First Edition, Pearson Education, 2006.
R.2	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich R. Tomassia, John Wiley and sons
Useful Links	
1	https://nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106/106/106106131/

	Course Outcomes	CL	Class Sessions
CO1	Classify algorithm efficiency and fundamental algorithmic strategies.	2	9
CO2	Demonstrate Divide & Conquer and Greedy strategies to solve problems and analyze their efficiency	3	9
CO3	Implement Dynamic Programming techniques to solve complex optimization problems	3	9
CO4	Apply Backtracking and Branch & Bound strategies to solve combinatorial problem.	3	9
CO5	Analyze NP-Hard and NP-Complete problems by identifying problem classes	4	9

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Second Year (Semester-IV) B. Tech. Information Technology

BSH42401: Discreet Mathematics & Graph Theory

Teaching Scheme		Examination Scheme (Th)	
Theory (Th)	2 Hrs/week	CT-I	7 Marks
Practical (P)		CT-II	7 Marks
Total Credits	**2**	CA	6 Marks
		ESE	30 Marks
		Total	50 Marks
		Duration of ESE: 2 Hrs	

Course Objective: Student will able to

1.	Formulate and solve recurrence relations, including linear recurrence relations with constant coefficients and Develop a foundational understanding of lattices, algebraic systems, and Boolean lattices, and their applications in computational theory.
2.	Understand the fundamental concepts of Fuzzy Sets and Systems, including the difference between crisp and fuzzy sets.
3.	Apply graph theory to solve problems, such as algorithmic graph problems.

Course Contents

Unit I	**Combinatorics**: Rules of Sum and Product, Permutations, Combinations. Pigeonhole Principle Recurrence Relation, Linear Recurrence Relations with constant coefficients, Total Solutions Applications of Relations and Functions, **Groups, Ring and Lattices :** Algebraic Systems, Semi Group, Groups, Monoide, Abellian Group, Sub Group, Isomorphism, Automorphisms and homomorphism group, Rings, Integral Domain & Fields Lattices and Algebraic Systems, Boolean Lattices.
Unit II	**Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets and Systems, Crisp Set, Operations and Combinations on Fuzzy Sets, Relation Between Crisp and Fuzzy Sets, Fuzzy Relation, Overview of Fuzzy logic and Classical Logic.
Unit III	**Graph Theory:** Basic Concepts of Graph Theory, Digraphs, Basic Definations, Matrix Representations of Graphs, Subgraphs and Quetiont Graph, Isomorphic Graph, Paths and Circuits, Reach ability and connectedness, Node base, Eulers Path and Hamiltons Path, Binary Tree, Undirected Tree, Spanning Tree, Weighted Graph (Only Definations & Examples), Minimum Spanning tree by Prims Algorithm and Kruskals Algorithm, Representation of Algebraic Expression by Venn Diagram, and Binary Tree.

Text Books

T.1	C. L. Liu and D. P. Mohptra, " Elements of Discrete Mathematics", 4th Edition, MCGraw Hill

T.2	Kenneth H. Rosen, " Discretr Mathematics and Its Applicatios", 7th Edition, MCGraw Hill
T.3	Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, " Discrete Mathematical Structural", 6th Edition, Prentice Hall of India.

Reference Books	
R.1	Edger G. Goodaire, Michael M. parmenter, " Discrete Mathematics with Graph Theory", 3rd Edition, Pcarson Education.
R.2	Tremblay J. S., " Discrete mathematical structures with Applications", 3rd Edition, Tata MCGraw Hill
R.3	Mathematics for Engineers by Chandrika Prasad
R.4	A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

Course Code	Course Outcomes	CL	Class Sessions
BSH42401.1	**Solve** Recurrence Relations, Generating Functions, Combinatorial Problems **and Understand the concepts of Groups, Rings, Lattices.**	3	9
BSH42401.2	**Interprete** Fuzzy Set Theory and d Uncertainty Concept.	3	9
BSH42401.3	**Analyze** Computational Problems in Graph Theoretical Framework.	4	9

	Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 **NAAC Accredited (A+ Grade)**	

Second Year (Semester-IV) B. Tech. Information Technology

BIT42413: Open Elective-II (Artificial Intelligence)

Teaching Scheme		Examination Scheme	
Theory	**2 Hrs/week**	CT-I	7 Marks
Tutorial	**-**	CT-II	7 Marks
Total Credits	**02**	CA	06 Marks
		ESE	30 Marks
		Total	50 Marks
		Duration of ESE: 2Hrs	

Course Objectives: Student will be able to

1.	Understand the fundamental concepts and terminologies of AI and Machine Learning.
2.	Develop skills to choose, plan, and execute AI projects collaboratively within a team.
3.	Recognize the roles and responsibilities of AI team members within organizations.

Course Contents

Unit I	Introduction: Machine Learning, What is data, The terminology of AI, What makes an AI company, What machine learning can and cannot do, Non-technical explanation of deep learning, basics of neural networks, Examples of AI, Application domains of AI.
Unit II	Building AI projects: Workflow of a machine learning project, Workflow of a data science project, how to use data, How to choose an AI project, Working with an AI team, How to process and visualize data, Technical tools for AI teams, use of Python in AI related projects
Unit III	Building AI in Your Company: Smart speaker, Case Study: Self-driving car, Example roles of an AI team, AI pitfalls to avoid, Survey of major AI application areas. AI and Society: A realistic view of AI, Discrimination / Bias, Adversarial attacks on AI, Adverse uses of AI, AI and developing economies, AI and jobs

Text Books

T.1	Artificial Intelligence: A Modern Approach — Stuart Russell, Peter Norvig, 2010, Prentice Hall
T.2	Introduction to Cyber Security: Guide to the World of Cyber Security, AnandShinde

Reference Books

R.1	Artificial Intelligence for Humans — Jeff Heaton, 1st Edition, Independent Publishing

Useful Links

1	https://onlinecourses.nptel.ac.in/noc22_cs56/preview

	Course Outcomes	CL	Class Sessions
CO1	Explain the fundamental concepts and terminologies of Artificial Intelligence and Machine Learning.	2	9
CO2	Describe the workflows of Machine Learning and Data Science projects.	2	9
CO3	Illustrate major application areas of AI in industries, assessing their potential and limitations.	2	9

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Second Year (Semester-IV) B. Tech. Information Technology

BIT42403: Object Oriented Programming with C++ Lab

Teaching Scheme		Examination Scheme	
Practical	**2 Hrs/week**	CA	25Marks
Total Credits	**1**	ESE	25Marks
		Total	50Marks

Sr. No	List of Practical	CO
1	Write a programs to implement the concepts of classes and object.	CO1
2	Develop a program that uses a class where the member functions are defined outside And inside a class.	CO1
3	Implement a program to demonstrate the use of static data members.	CO2
4	Design a program to Demonstrate concept of a. Arrays within a class, Arrays of Objects (e.g Develop program to calculate best of two class Test marks of six subjects of a student) b. Objects as Function Arguments, Returning Objects. (e.g. Complex number arithmetic).	CO2
5	Develop a program to demonstrate Opening and Closing of file using constructors and open ( ) function.	CO3
6	Write a program to demonstrate the use of explicit constructor.	CO3
7	Design a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.	CO4
8	Develop a program to demonstrate the overloading of increment and decrement operators	CO4
9	Write C++ programs that illustrate how the following forms of inheritance are supported: a)Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance.	CO5
10	Design a program to implement Array of pointers, pointer to functions, pointer to objects.	CO5

Text Books	
1	Object Oriented Programming with C++ by Balagurusamy
2	C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.
Reference Books	
1	C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2	The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education.
Useful Links	
1	https://mrcet.com/downloads/digital_notes/HS/OOP%20LAB%20MANUAL%202018-19.pdf
2	https://sreevahini.edu.in/pdf/oops.pdf

	Course Outcomes	CL	Lab Sessions
CO1	Describe class object concepts by using C++.	2	4
CO2	Illustrate programs using inheritance and polymorphism.	2	4
CO3	Classify the significance of constructors and destructor.	2	4
CO4	Apply function and operator overloading using C++.	3	4
CO5	Demonstrate generic classes using template concepts.	3	4

Tulsiramji Gaikwad-Patil College of Engineering and Technology

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Second Year (Semester-IV) B. Tech. Information Technology

BSH42404: Leadership and Team Effectiveness

Teaching Scheme	
Theory	**2 Hrs/week**
Tutorial	**-**
Total Credits	**2**

Examination Scheme	
CT-I	7 Marks
CT-II	7 Marks
CA	6 Marks
ESE	30 Marks
Total	50 Marks
Duration of ESE: 2Hrs	

Course Objectives:

1.	To provide a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
2.	To develop an understanding of the interpersonal processes and group dynamics.
3.	To provide a theoretical understanding of leadership practices in organizations.

Course Contents

Unit I	Introduction to Leadership & Team Management; Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development-The Action-Observation-Reflection Model LMX Theory and Normative Decision Model; Situational Leadership Model; Contingency Model and Path Goal Theory; Emotional Approach Charismatic and Transformational Leadership; Leadership for Tomorrow
Unit II	Leadership Attributes: Personality Traits and Leadership; Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership Power and Leadership: The art of influence in leadership: Leadership and "Doing the Right Things: Character-Based Approach to Leadership; Role of Ethics and Values in Organisational Leadership
Unit III	Leadership Behaviour; Leadership Pipeline: Assessing Leadership Behaviors: Multi-rater Feedback Instruments: The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management Negotiation and Leadership: Leadership under a crisis situation: The Situation and the Environment: Culture and Leadership: Global Leadership

Text Books

T.1	Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett, R.C., & Curphy, G.J. (2019), 9th Edition, McGraw Hill Education, Chennai, India.

Reference Books	
R.1	https://www.summary.com/book-summary/the-first-90-days/
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_mg39/preview

CO	Course Outcomes	CL	Class Sessions
BSH42404.1	Explain how global leadership skills contribute to leadership effectiveness.	2	9
BSH42404.2	Understand the leader's role in team-based organizations.	2	9
BSH42404.3	Classify the potential contribution of outdoor training to the development of team leadership.	2	9

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Second Year(Semester-IV)B.Tech. Information Technology

BBA42402: Innovation & Entrepreneurship

Teaching Scheme		Examination Scheme	
Lectures	2Hrs./week	**CIE**	20 Marks
Tutorial	-	**ESE**	30Marks
Total Credit	2	**Total**	50Marks
		Duration of ESE: 02Hrs. 00Min.	

Course Objective:

1	To know the students about basic concept of economics.
2	To aware the students about competitions and entrepreneurship.
3	To get the knowledge of sales and marketing.

Course Contents		Hours
Unit I	**Theory of Demand & Utility:** Law of Demand, Types of Demand, Elasticity of Demand, Methods of measurement of elasticity of demand, law of diminishing marginal utility. **Theory of Production:** Factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur).	**(9)**
Unit II	**Price Determination & Depreciation:** Laws of return, Average cost, Marginal cost, fixed cost, variable cost, Depreciation, Methods to calculate depreciation. **Market:** Perfect competition, Imperfect competition (monopoly, oligopoly, monopolistic competition).	**(9)**
Unit III	**Entrepreneurship, Business Plan and Idea Presentation:** Definition, Steps towards successful enterprise, opportunity identification, various analytics to be performed for idea validation. **Business Plan and Idea Presentation:** Transforming idea to plan on paper, various reports for validation of business, presenting and pitching idea.Stages of idea stage to fully scaled corporation, types of company and their difference in specifications, legislation and legal precautions, finding sources, stages of funding, various methods of collaborations, disinvestment, winding up company.	**(9)**

Text Books

1	O.P. Khanna, *Industrial Engineering and Management*, Dhanpat Rai & Sons, 1999.
2	R. Panner Selvam, *Production and Operations Management*, PHI Learning, 2002.
3	Mart and Telsang, *Industrial Engineering and Production Management*, S. Chand and Co., 1998.

Reference Books

1	Shailendra Kale, *Production and Operations Management*, McGraw Hill, India 2013.
2	Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins, S.P. and Decenzo David A.
3	Economics**:** Principles of Economics, N Gregory Mankiw, Cengage Learning.
4	Principles and Practices of Management by L.M. Prasad.

Useful Links

https://onlinecourses.nptel.ac.in/noc22_mg70/preview

CO	**Course Outcomes**	**CL**
1	Describe demand & utility of product in industries.	**2**
2	Discuss the terms price determinations, depreciation, and market	**2**
3	Apply the elements of a business plan required to set up and start a business.	**3**

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Program: B. Tech. Second Year

Semester-IV | **Human Values for Professional Society: BSH42404**

Teaching Scheme		Examination Scheme(Th)		Examination Scheme(P)	
Theory (Th)	2 Hrs./ Week	**CT-I**	7 Marks	-	-
Practical(P)	-	**CT-II**	7 Marks	-	-
Total Credits	**2(Th)**	**CA**	6 Marks	-	-
Duration of ESE:2 Hrs.		**ESE**	30 Marks	-	-
		Total Marks	**50 Marks**	-	-

Pre-Requisites:

Course Objectives:

1.	**To explain** the difference between values and ethics and to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2.	**To understand** harmony in the Family and Society-Human Relationship.
3.	**To apply** in the professional and ethical life.

Course Contents

Unit-I	**Need, Content and Process for Value Education:-** Meaning and importance of Value Education, Types of Values - Personal Values, Social Values, and Moral Values & Spiritual Values, Relevance of Human values: Integrity, Empathy, .
Unit-II	**Harmony in the Human Life:-** Define Harmony and significance of Harmony, Importance of - Harmony in the family, society and human relationship, and understand Harmony with self and Nature.
Unit-III	**Ethics in the Professional Society:-** Nature, characteristics and scope of professional ethics; Types of Professional Ethics, Professional Values: Trusteeship, Inclusiveness, Commitment, Sustainability, Accountability, Transparency, Impartiality.

Text Books:-

1	R.R. Gaur, R Sangal, G.P. Bagaria (2009): A Foundation Course in Human Values and Professional Ethics, Excel Books
2	D.R. Kiran (2014) Professional Ethics and Human Values, McGraw Hill Education (India).

Reference Books:-

1	LaFollette, Hugh, ed. Ethics in Practice: An Anthology. Cambridge: Blackwell,1997
2	Vivian L Vignoles (2017): Identity: Personal and Social, Chapter to appear in Oxford Handbook of Personality and Social Psychology (2nded.), edited by Kay Deaux and Mark Snyder.
3	Happiness and Well-Being, NIOS Module V (Health and well-being)

Useful Links:-

1. https://onlinecourses.nptel.ac.in/noc23_hs89/preview
2. https://archive.nptel.ac.in/courses/109/104/109104068

	Course Outcomes	CL	Class Session
CO1	**Explain** the importance of values education in life.	2	9
CO2	**Illustrate** the significance of harmony in family and society.	2	9
CO3	**Describe** ethics in personal and professional life.	2	9

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Second Year (Semester-IV) B. Tech. Information Technology

BIT42404: Operating System using Python Lab

Teaching Scheme			Examination Scheme	
Practical	**2 Hrs/week**		CA	25 Marks
Total Credits	**1**		ESE	25 Marks
			Total	50 Marks

Sr. No	List of Practical	CO
1	Exploring Different Types of Operating Systems	CO1
2	Apply Use system monitoring tools (e.g., ps, top, vmstat) to observe machine-level resource utilization.	CO1
3	Write a Program to implement file operations (create, read, write, append, and delete) in Python to understand the concepts of file management, file attributes, and file operations.	CO2
4	Write a Program to create and manage processes using Python's multiprocessing module to understand process creation, scheduling, and inter-process communication..	CO2
5	Write A Program to simulate paging and address translation between logical and physical memory.	CO3
6	To implement and compare page replacement algorithms (FIFO, LRU, Optimal) and evaluate their performance in handling page faults.	CO3
7	Write a Program to implement the critical section problem using semaphores to achieve mutual exclusion and prevent race conditions.	CO4
8	Write a Program to implement the Producer-Consumer problem using semaphores to synchronize producer and consumer processes and avoid buffer overflow/underflow.	CO4
9	To implement deadlock prevention strategies (e.g., resource ordering, preemption) and prevent deadlocks by eliminating necessary conditions.	CO5
10	Write a Program to implement deadlock detection and recovery mechanisms	CO5

Text Books	
1	Modern Operating Systems by Andrew S. Tanenbaum
2	Python Programming for the Absolute Beginner by Michael Dawson
Reference Books	
1	Python for Systems Programming" by Brian P. Ladd
2	Python Programming: An Introduction to Computer Science **by** John Zelle
Useful Links	
1	https://www.geeksforgeeks.org/operating-systems/
2	https://docs.python.org/3/library/os.html#os.getpgid

	Course Outcomes	CL	Lab Sessions
CO1	Illustrate OS types in computing environment & Use of system monitoring tools	2	4
CO2	Implement file management , file operations, process creation and scheduling	3	4
CO3	Apply the Concepts of paging and address translation, FIFO, LRU, and Optimal page replacement algorithms	3	4
CO4	Analyze the semaphores to solve the critical section problem, to synchronize producer-consumer processes and manage buffer overflow/underflow.	4	4
CO5	Evaluate various deadlock prevention techniques, detection and recovery techniques,	5	4

Tulsiramji Gaikwad -Patil College of Engineering and Technology

Wardha Road, Nagpur-441108

NAAC Accredited with A+ Grade

(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)

Second Year (Semester-IV) B.Tech. Information Technology

BIT42405: Design and Analysis of Algorithms Lab

Teaching Scheme		Examination Scheme	
Practical	**2 Hrs/week**	CA	25 Marks
Total Credits	**1**	ESE	25 Marks
		Total	50 Marks

Sr. No	List of Practical	CO
1	To classify the program to implement Recursive and iterative Linear and Binary Search	CO1
2	Write a program to implement Masters Theorem.	CO1
3	Classify a program to implement Quick sort and analyze its best, average and worst case	CO2
4	Write a program to implement minimum cost spanning tree using Krushkal's Algorithm	CO2
5	To write a program to implement Floyd's warshall algorithm.	CO3
6	Write a program to implement 0/1 Knapsack problem using Dynamic Programming	CO3
7	Write a program to implement N Queen Problem using Backtracking.	CO4
8	Design and implement C/C++ Program to find a subset of a given set S = {sl,s2,…..,sn} of n positive integers whose sum is equal to a given positive integer d.	CO4
9	Write a program to implement Traveling salesman problem using Brach and Bound method	CO4
10	To demonstrate the concept of Cook's Theorem.	CO5

Text Books	
1	Design & Analysis of Computer Algorithms by Aho, Pearson education. Horowitz, Sa Rajsekharam
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall, 2010.
Reference Books	
1	Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, "The Design and Analysis of Computer Algorithms", First Edition, Pearson Education, 2006.
2	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich R. Tomassia, John Wiley and sons
Useful Links	
1	https://nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106/106/106106131/

	Course Outcomes	CL	Lab Sessions
BIT42405.1	Classify algorithm efficiency and fundamental algorithmic strategies.	2	4
BIT42405.2	Demonstrate Divide & Conquer and Greedy strategies to solve problems and analyze their efficiency	3	4
BIT42405.3	Implement Dynamic Programming techniques to solve complex optimization problems	3	4
BIT42405.4	Apply Backtracking and Branch & Bound strategies to solve combinatorial problem.	3	4
BIT42405.5	Analyze NP-Hard and NP-Complete problems by identifying problem classes	4	4