Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering

SoE & Syllabus 2018

3rd **to 8th** Semester

Information Technology

28 June 2019

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

SoE No. IT-201

B.E. SCHEME OF EXAMINATION 2018-19

(Revised Scheme of Examination w.e.f. 2020-21 onward)

Information Technology

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
				TOTAL FIRST & SECOND SEM						**47**				
Third Semester														
1	3	BS	GE2201	Engineering Mathematics III	**T**	3	0	0	3	3	30	30	40	3
2	3	PC	IT2201	Digital Circuits & Microprocessors	**T**	3	0	0	3	3	30	30	40	3
3	3	PC	IT2202	Digital Circuits & Microprocessors Lab	**P**	0	0	2	2	1		60	40	
4	3	PC	IT2203	Object Oriented Programming	**T**	3	0	0	3	3	30	30	40	3
5	3	PC	IT2204	Object Oriented Programming Lab	**P**	0	0	2	2	1		60	40	
6	3	PC	IT2205	Data Structures and Program Design-I	**T**	4	0	0	4	4	30	30	40	3
7	3	PC	IT2206	Data Structures and Program Design-I Lab	**P**	0	0	2	2	1		60	40	
8	3	PC	IT2207	Computer Architecture & Organization (Self -Learning-Online)	**T**	3	0	0	3	3	30	30	40	3
9	3	PC	IT2208	Software Lab	**P**	0	0	2	2	1		60	40	
				TOTAL THIRD SEM		**16**	**0**	**8**	**24**	**20**				
Fourth Semster														
1	4	BS	GE2206	Discrete Mathematics and Probability Theory	**T**	3	0	0	3	3	30	30	40	3
2	4	PC	IT2251	Data Structures and Program Design-II	**T**	3	0	0	3	3	30	30	40	3
3	4	PC	IT2252	Data Structures and Program Design-II Lab	**P**	0	0	2	2	1		60	40	
4	4	PC	IT2253	Computer Networks	**T**	4	0	0	4	4	30	30	40	3
5	4	PC	IT2254	Computer Networks Lab	**P**	0	0	2	2	1		60	40	
6	4	PC	IT2255	Operating Systems	**T**	3	0	0	3	3	30	30	40	3
7	4	PC	IT2256	Operating Systems Lab	**P**	0	0	2	2	1		60	40	
8	4	PC	IT2257	Theory of Computation	**T**	3	0	0	3	3		60	40	
				TOTAL FOURTH SEM		**16**	**0**	**6**	**22**	**19**				
Audit Courses														
1	4	HS	GE2121	Env Studies for 4 Sem. CV,ME,EE,IT	**A**	3	0	0	3	0				

MSEs* = Two MSEs of 15 Marks each will conducted and marks of of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activitied decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

TA = for Practical : MSPA will be 15 marks each**

		June 2020	**1.02**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2020-21 Onwards

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Information Technology

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
Fifth Semester														
1	5	HS	GE2312	Fundamental of Economics	**T**	3	0	0	3	3	30	30	40	3
2	5	PC	IT2301	Data Base Management Systems	**T**	3	0	0	3	3	30	30	40	3
3	5	PC	IT2302	**Lab :** Data Base Management Systems	**P**	0	0	2	2	1		60	40	
4	5	PC	IT2303	Software Engineering (Self -Learning-Online)	**T**	3	0	0	3	3	30	30	40	3
5	5	PE		**Professional Elective - I**	**T**	3	0	0	3	3	30	30	40	3
6	5	PE		**Lab : Professional Elective-I**	**P**	0	0	2	2	1		60	40	
7	5	OE		**Open Elective-I**	**T**	3	0	0	3	3	30	30	40	3
8	5	OE		**Open Elective-II**	**T**	3	0	0	3	3	30	30	40	3
9	5	STR	IT2310	**Industrial Visit and Learning**	**P**	0	0	0	0	1		100		
				TOTAL FIFTH SEM		**18**	**0**	**4**	**22**	**21**				

Professional Electives -I

1	5	PE-1	IT2311	PE I: Web Programming
	5	PE-1	IT2312	PE I: Lab.: Web Programming
2	5	PE-1	IT2313	PE I: Data Analysis and Statistics
	5	PE-1	IT2314	PE I: Lab.: Data Analysis and Statistics
3	5	PE-1	IT2315	PE I: Customer Relationship Management
	5	PE-1	IT2316	PE I: Lab. Customer Relationship Management

Open Electives -I

1	5	OE I	IT2321	OE I: Industry 4.0
2	5	OE I	IT2322	OE I: Core JAVA

Open Electives -II

1	5	OE-II	IT2331	OE II: Introduction to Machine Leqarning
2	5	OE-II	IT2332	OE II: Information Security

MSEs* = Two MSEs of 15 Marks each will conducted and marks of of these 2 MSEs will be considered for Continuous Assessment

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TA = for Practical : MSPA will be 15 marks each**

		June 2020	1.02	Applicable for AY 2020-21 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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Information Technology

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
Sixth Semester														
1	6	HS	GE2311	Fundamentals of Management	**T**	3	0	0	3	3	30	30	40	3
2	6	PC	IT2351	Design & Analysis of Algorithms	**T**	3	0	0	3	3	30	30	40	3
3	6	PC	IT2352	**Lab:** Design & Analysis of Algorithms	**P**	0	0	2	2	1		60	40	
5	6	PC	IT2353	Principles of Compiler Design	**T**	3	0	0	3	3	30	30	40	3
6	6	PC	IT2354	**Lab:** Principles of Compiler Design	**P**	0	0	2	2	1		60	40	
7	6	PE		**Professional Elective - II**	**T**	3	0	0	3	3	30	30	40	3
8	6	PE		**Lab : Professional Elective-II**	**P**	0	0	2	2	1		60	40	
9	6	OE		**Open Elective-III**	**T**	3	0	0	3	3	30	30	40	3
10	6	OE		**Open Elective-IV**	**T**	3	0	0	3	3	30	30	40	3
				TOTAL SIXTH SEM		**18**	**0**	**6**	**24**	**21**				

List of Professional Electives-I & II

Professional Electives -II				
	6	PE-2	IT2361	PE II::Machine Learning
1	6	PE-2	IT2362	PE II:Machine Learning Lab
	6	PE-2	IT2363	PE II: Business Intelligence
2	6	PE-2	IT2364	PE II: Lab.: Business Intelligence
	6	PE-2	IT2365	PE II: Internet of Things
3	6	PE-2	IT2366	PE II: Lab.: Internet of Things

Open Electives -III

1	6	OE-III	IT2371	OE-III: Industry 4.0
2	6	OE-III	IT2372	OE-III : Core JAVA

Open Electives -IV

1	6	OE-IV	IT2381	OE-IV : Introduction to Machine Learning
2	6	OE-IV	IT2382	OE-IV : Information Security

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TA = for Practical : MSPA will be 15 marks each**

		June 2020	1.02
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2020-21 Onwards

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SoE No. IT-201.1

B.E. SCHEME OF EXAMINATION 2018-19

(Revised Scheme of Examination w.e.f. 2022-23 onward)

Information Technology

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
Seventh Semester														
1	7	PC	IT2401	Data Mining	**T**	3	0	0	3	3	30	20	50	3 Hours
2	7	PC	IT2402	Lab.: Data Mining	**P**	0	0	2	2	1		60	40	
3	7	PC	IT2403	Principles of Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
4	7	PE		Professional Elective III	**T**	3	0	0	3	3	30	20	50	3 Hours
5	7	PE		Professional Elective IV	**T**	3	0	0	3	3	30	20	50	3 Hours
6	7	PE		Lab.: Professional Elective IV	**P**	0	0	2	2	1		60	40	
7	7	PE		Professional Elective V	**T**	3	0	0	3	3	30	20	50	3 Hours
8	7	PE		Professional Elective VI	**T**	3	0	0	3	3	30	20	50	3 Hours
8	7	STR	IT2409	Mini Project	**P**	0	0	4	4	2		60	40	
9	7	STR	IT2410	Campus Recrutment Training (CRT)	**P**	0	0	0	0	2		100		
				TOTAL SEVENTH SEM		**18**	**0**	**8**	**26**	**24**				

List of Professional Electives-III, IV,V & VI

Professional Electives -III				
1	7	PE-3	IT2411	PE III: Cloud Computing
2	7	PE-3	IT2412	PE III:Real Time Systems
3	7	PE-3	IT2413	PE III: Network Security
4	7	PE-3	IT2414	PE III: Information Retrieval
Professional Electives -IV				
1	7	PE-4	IT2421	PE IV: Neural Network and Fuzzy Logic
	7	PE-4	IT2422	PE IV: Lab.: Neural Network and Fuzzy Logic
2	7	PE-4	IT2423	PE IV: Ethical Hacking and Cyber Forensics
	7	PE-4	IT2424	PE IV:Lab:Ethical Hacking and Cyber Forensics
3	7	PE-4	IT2425	PE IV: Human Computer Interaction
	7	PE-4	IT2426	PE IV: Lab:Human Computer Interaction
4	7	PE-4	IT2427	PE IV: Parallel Computing
	7	PE-4	IT2428	PE IV: Lab: Parallel Computing
Professional Electives - V				
1	7	PE-5	IT2431	PE V: Digital Image Processing
2	7	PE-5	IT2432	PE V: Distributed Systems
3	7	PE-5	IT2433	PE V: Coding Standardand and Technical Documentation
4	7	PE-5	IT2434	PE V: Introduction to Deep Learning
5	7	PE-5	IT2435	PE V: Wireless Sensor Network
Professional Electives - VI				
1	7	PE-6	IT2441	PE VI: Advanced Computer Architecture
2	7	PE-6	IT2442	PE VI: Mobile Communication
3	7	PE-6	IT2443	PE VI: E-commerce
4	7	PE-6	IT2444	PE VI: Natural Language Processing

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TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.06**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

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B.E. SCHEME OF EXAMINATION 2018-19

(Revised Scheme of Examination w.e.f. 2022-23 onward)

SoE No. IT-201.1

Information Technology

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
Eighth Semester														
1	8	STR	IT2451	Major Project	**P**	0	0	12	12	9		60	40	
2	8	STR	IT2452	Extra curricular Activity Evaluation	**P**	0	0	0	0	1		100		
TOTAL EIGHTH SEM						**0**	**0**	**12**	**12**	**10**				

MSEs* = Two MSEs of 15 Marks each will conducted and marks of of these 2 MSEs will be considered for Continuous Assessment

TA = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activities decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities**

TA = for Practical : MSPA will be 15 marks each**

		June 2022	**1.06**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

III Semester
GE2201 - Engineering Mathematics III

Objectives	Outcomes
1. Able to find numerical solution of various mathematical equations 2. Give knowledge of Laplace transform, Z transform, Fourier transform 3. Define the periodic functions in the form of Fourier series 4. Solve partial differential equations	The student will be able to: 1. Estimate the Calculus of Numerical Function. 2. Determine transforms and inverse transforms of various functions of variables and use it to solve Mathematical equations. 3. Discuss the nature of periodic function and express it in terms of series. 4. Use appropriate method/s to solve partial differential equations.

Unit I: Finite Differences
Difference table; Operators E and Δ, Central differences, Factorials notation, Numerical differentiation and integration, Difference equations with constant coefficients. **(6 hours)**

Unit II: Laplace Transform
Laplace Transforms: Laplace transforms and their simple properties, Unit step function, inverse of Laplace transform, convolution theorem, Applications of Laplace transform to solve ordinary differential equations .**(7 hours)**

Unit III: Z-transform
Z-Transform definition and properties (with proof), inversion by partial fraction decomposition and residue theorem, Applications of Z-transform to solve difference equations with constant co-efficient. **(6 hours)**

Unit IV: Fourier Series
Periodic Functions and their Fourier series expansion, Fourier Series for even and odd function, Change of interval, half range expansions **(7 hours)**

Unit V: Partial Differential Equation
Partial Differential Equations of first order first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficient. Application of variable separable method to solve first and second order partial differential equations. **(7 hours)**

Unit VI : Fourier Transform : Definition: Fourier Integral Theorem, Fourier sine and cosine integrals, Finite Fourier sine & cosine Transform Parseval's Identity, convolution Theorem**.** **(6 hours)**

Text Books:

SNo	Title	Edition	Authors	Publisher
1	Advance Engineering Mathematics	9th Edition (September 2009)	Kreyszig.	Wiley
2	Higher Engineering Mathematics	40th edition, (2010)	B.S. Grewal	Khanna Publishers (2006)
3	Advanced Engineering Mathematics	8th revised edition, 2007	H.K. Dass	Publisher: S.Chand and Company Limited

Reference Books:

SNo	Title	Edition	Authors	Publisher
1	Mathematics for Engineers	19th edition, (2007)	Chandrika Prasad.	John Wiley & Sons
2	Advanced Mathematics for Engineers	4th edition, (2006)	Chandrika Prasad	John Wiley & Sons
3	Applied Mathematics for Engineers	3rd edition, (1970)	L.A. Pipes and Harville	McGraw Hill
4	A text Book of Applied Mathematics	3rd edition, (2000)	P.N. and J.N. Wartikar	Pune Vidyarthi Griha Prakashan
5	A text book of Engineering Mathematics	Reprint 2008	N.P. Bali and Manish Goyal	Laxmi Prakashan

III SEMESTER

IT2201	Digital Circuits and Microprocessors		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total		ESE Duration
	30	10	60	100		3 Hours

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
1. To acquaint students with knowledge of basic electronics using digital number systems, Boolean algebra, logic gates. 2. To understand combinational and sequential circuits and their applications in real time. 3. Students will Study the hardware and software components, different modes of working and accessing memory & I/O ports of a microprocessor based system work together to implement system–level features. 4. Students will Study the assembly language programming structure of 8086 & various types of instruction set with encoding format.Students will Study to Design & interface the memory & I/O with 8086 & Working principal of 8255 PPI	**After completion of this course:** 1. Student will able to be to understand designing of basic circuits using logic gates and Boolean algebra, and designing of combinational logic circuits. 2. Student will able to understand designing of counters and registers. 3. Students will be able to understand the architecture and organization of microprocessor along with instruction coding formats,addressing modes, Instructions sets of 8086. 4. Students will be able to understand the interfacing of memory And I/O with 8086 and interfacing and working principle of 8255 PPI.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	1	1	1	1	2
	Student will able to be to understand designing of basic circuits using logic gates, and basic combinational logic circuits.	2.0	2.0	2.0											
	Student will able to understand designing of counters and registers.	2	2	2.0											
	Students will be able to understand the architecture and organization of microprocessor along with instruction coding formats.	3	2			1								2	

III SEMESTER

IT2201	Digital Circuits and Microprocessors		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total		ESE Duration
	30	10	60	100		3 Hours

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment.**

	Students will be able to understand the interfacing of memory And I/O with 8086 and interfacing and working principle of 8255 PPI.	3	3			2								2	3
IT															

Unit No.	Contents	Max. Hrs.
1	Basic logic circuits, Boolean laws, Simplification of function using algebraic methods, basic combinational logic circuits: Encoder, Decoder, Multiplexer, De-multiplexer, Totem pole and tristate output.	8
2	Simplification of sum of product and product of sum, K-maps (Up to 4 Variable), simplification of completely/ incompletely specified functions using K-maps & Quine McCluskey's method, Introduction to Flip Flops (RS, D, T, JK), Memory organization using Flip-Flops. Racing Condition, J-K Master Slave Flip flop. Excitation tables, Conversion of one type to another type flips flop.	8
3	Excitation tables, Introduction to sequential Circuits, Counters, Registers, Synchronous/Asynchronous Designs, modulo N counter with Reset or Clear facility, Design of Mod N counters Using K-map, Lock Free Counters.	7
4	Introduction: Internal architecture & pin diagram of 8086/8088 microprocessor, Minimum & Maximum mode, even & odd memory banks, Accessing memory & I/O ports, Memory mapping in minimum mode.	8
5	Programming with 8086/8088: Addressing Modes, Instruction set, Instruction encoding format, Timing diagram Assembler directives, 8086 programming examples, String operations, File I/O processing, Far & Near procedures, Macros, Timing & delay loops	8
6	Interfacing with 8086/8088: Memory interfacing, Programmable parallel ports, Intel 8255 PPI, Block diagram & interfacing, Modes & initialization.	6

III SEMESTER

IT2201	Digital Circuits and Microprocessors		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration	
	30	10	60	100	3 Hours	

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment.**

Text Books

Sr. No	Title	Edition	Authors	Publisher
1	Fundamentals of Logic Design	5th Edition	Charles Roth	CENGAGE Learning
2	Fundamentals of Digital Circuits	2nd Edition	Anand Kumar	PHI
3	Digital Electronics Principles	6th edition,1998	Malvino	Career Education
4	Microprocessor & Interfacing, Programming & Hardware.	2nd Edition , 2006.	Douglas Hall	Tata McGraw Hill
5	Microcomputer System: The 8086/8088 Family, Architecture, programming & Design	2nd Edition,1986.	Y. Liu, G. Gibson	Prentice Hall of India Ltd., New Delhi
6	Advanced Microprocessors & Peripherals: Architecture, Programming & Interfacing	2006	A. Ray, K.M. Bhurchandi	Tata McGraw Hill,

III SEMESTER

IT2202	Lab: Digital Circuits and Microprocessors	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment.**

Course Learning Objective	Course Outcomes
1. To acquaint students with knowledge of basic electronics using Boolean algebra & logic gates. 2. To understand combinational and sequential circuits and their applications in real time. 3. Students will Study different instructions 4. Students will study the assembly language programming structure of 8086 & various types of instruction set with encoding format.	After completion of this course: 1. Student will able to be to understand designing of basic circuits using logic gates and Boolean algebra, and designing of combinational logic circuits. 2. Student will able to understand designing of counters and registers. 3. Students will be able to understand the architecture and organization of microprocessor along with instruction coding formats,addressing modes, Instructions sets of 8086. 4. Students will be able to understand the interfacing of memory And I/O with 8086 and interfacing and working principle of 8255 PPI.

Sr. No	Problem Statements
1	1. Study of Logic Gates – Discrete version & IC version: AND, OR, NOT, NAND, NOR Gates – To construct and verify the Truth Tables.
2	2.Study and configure of flip-flop, registers and counters using digital ICs. Design digital system using these circuits.
3	3. Study of Half Adder and Full Adder circuits – To Construct and verify the Truth Table.
4	To study Multiplexer and Demultiplexer circuits..
5	To study assembler, linker, MASM,TASM, 8086 Simulator and assembly language programming instructions of 8086 microprocessors.
6	To write & execute Assembly Language program to multiply two 16 bit numbers and Divide two numbers (16/8, 16/16, 8/8)
7	Write 8086 Assembly language program (ALP) to add array of N hexadecimal numbers stored in the memory. Accept input from the user.
8	To write & execute Assembly Language program to search a number in a string of N numbers.
9	.To write & execute Assembly Language program to sort out even and odd numbers from the given data string
10	.To write & execute Assembly Language program to transfer block of data from one memory block to another.

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BE SoE and Syllabus 2018

INFORMATION TECHNOLOGY

III SEMESTER

IT2203	Object Oriented Programming		L=3	T=0	P=0	Credits=4
Evaluation Scheme	MSEs-	TA	ESE	Total		ESE Duration
	30	10	60	100		3 Hours
Prerequisite Courses						

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
Student will : 1. Learn the Concepts of Java programming language 2. Learn Java's syntax, idioms, patterns, and styles to write simple JAVA program. 3. To develop object centric thinking and to use object oriented features of JAVA to write complex programs. 4. Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them in application development	After completion of the course students will be able to: 1. Demonstrate the understanding of Object oriented concepts. 2. Apply the programming language JAVA efficiently in object oriented software development 3. Able to analyze problem statement and identify appropriate objects and methods 4. Design and implement a small programs using classes 5. Design, develop, test, and debug programs using object oriented principles of java

Course Outcomes	Statement	Mapped PO												PSPO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Demonstrate the understanding of Object oriented concepts.	**3**													
CO2	Apply the programming language JAVA efficiently in object oriented software development	**3**	**3**												
CO3	Able to analyze problem statement and identify appropriate objects and methods		**3**	**3**											
CO4	Design and implement a small programs using classes		**3**	**3**											
CO5	Design, develop, test, and debug programs using object oriented principles of java			**3**											
		3	**3**	**3**											

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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INFORMATION TECHNOLOGY

III SEMESTER

IT2203	Object Oriented Programming		L=3	T=0	P=0	Credits=4
Evaluation Scheme	MSEs*	TA	ESE	Total		ESE Duration
	30	10	60	100		3 Hours
Prerequisite Courses						

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Unit No.	Contents	Max. Hrs.
1	**UNIT I** : Introduction to Object oriented programming, Introduction to Java as OOP language: Importance of java, Parts of the java language, Java Environment, Structure Of A Java Program. Building blocks of java, Data types, Variable declarations ,operators and Assignments ,control structures, objects and classes, Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control	08
2	**UNIT II** : Java as OOP language, Other Class Modifiers: static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances)	07
3	**UNIT III** : Arrays, Strings Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes,	08
4	**UNIT IV** : exception handling mechanism: Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses,	07
5	**UNIT V** : Collection Vector and Framework: Introduction to collection framework, Vectors, Array List, Linked list, Hashset, Treeset, Hashmap	07
6	**UNIT VI** : IO Steam, applets and Thread: Introduction to stream classes, use of stream classes, I/O stream, bytes stream, character stream, pre-defined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files, transient and volatile modifiers, Introduction to applets, applet lifecycle, creating and executing applets, Introduction to multithreading, life cycle of Thread, Runnable interface and Thread class.	08

Text Books			
Sr.No	Title	Authors	Publisher
1	Thinking in Java	Bruce Eckel	Prentice Hall
Reference Books			
1	Java2 Complete Reference	Herbert Schildt	McGraw-Hill
2	Programming with Java	E. Balagurusamy	TATA McGraw-Hill

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

III SEMESTER

IT2204	Lab: Object Oriented Programming		L=0	T=0	P=2	Credits=1
Evaluation Scheme	**MSEs**	**TA**	**ESE**	**Total**	**ESE Duration**	
	--	10	60	100	3 Hours	

Course Learning Objective	Course Outcomes
Be able to use the JAVA SDK environment to create, debug and run simple JAVA programs.	Design, develop, test, and debug programsusing object oriented principles using java s.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Design, develop, test, and debug programs using object oriented principles using java														

Sr. No	Experiments Base On
1.	Introduction of JAVA Programming Environment
1.	Data Types and Control Structures
2.	Class and constructor
3.	Overloading
4.	Overriding
5.	Interface
6.	Arrays and String
7.	Exception
8.	Collection
9.	Applet

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INFORMATION TECHNOLOGY

III SEMESTER

IT2205	Data Structures and Program Design- I		L=4	T=0	P=0	Credits=4
Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration	
	30	10	60	100	3 Hours	
Prerequisite Courses						

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
1. Given knowledge about structured programming. 2. Students should develop skills to create error free and efficient programs; by applying data -structures fundamentals and program analysis techniques	Upon successful completion of this course, students will be able to: 1. Comprehend programming constructs like function, array, string, pointer, structure, file and also understand basic data structures like list, stack, queue. 2. Apply appropriate data structures in problem solving. 3. Analyze the performance of operations performed on data structures. 4. Design application by using data structures for real world problems.

Unit No.	Contents	Max. Hrs.
1	Functions, parameter passing techniques, recursion, Scope rules, Storage Classes, pointers, dynamic allocation	5
2	Arrays and strings, representation of 1D, 2D arrays in memory, sparse matrices, polynomial representation and operations, Structure, union, file handling	5
3	Time and space complexity algorithm, Abstract Data Type (ADT), ordered list, implementation using array and its operations, Stack, Queues and its operations	7
4	Applications of stacks and queues, Priority Queues, Circular Queue, Dequeue	
5	Linked list: implementation of linked list using arrays and pointers, operations on singly, doubly and circular linked list, linked stack and queue	6
6	Generalized list, Skip list, applications of linked list	5

Text Books/Reference Book			
Sr. No.	Title	Authors	Publisher
1	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall of India
2	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill
3	How to Solve it by Computer	R. G. Dromey	Pearson Education
4	Data Structures & Program Design in C	Robert Kruse, G. L. Tondo and B. Leung	PHI-EEE
5	Data Structures	Seymour Lipschutz	Tata McGraw-Hill
6	Fundamentals of Data Structures in C	Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed	W. H. Freeman and Company.

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

III SEMESTER

IT2206	Lab : Data Structures and Program Design- I	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	--	40	60	100	--

Course Learning Objective	Course Outcomes
1. Given knowledge about structured programming. 2. Students should develop skills to create error free and efficient programs; by applying data -structures fundamentals and program analysis techniques	Upon successful completion of this course, students will be able to: 1. Comprehend programming constructs like function, array, string, pointer, structure, file and also understand basic data structures like list, stack, queue. 2. Apply appropriate data structures in problem solving. 3. Analyze the performance of operations performed on data structures. 4. Design application by using data structures for real world problems.

Sr. No	Problem Statements
1	Program for counting number of digits in a random number
2	Program for generating list of random numerals and print them in words
3	Program to print Pascal's triangle 1 1 1 1 2 1 1 3 3 1 1 4 6 4 1 1 5 10 10 5 1
4	Program for finding GCD of two numbers using factorial method
5	Program for finding GCD of two numbers using recursion. Also, print number of recursive calls.
6	Program for allocating memory dynamically for single dimensional array and sort it using quick sort and merge sort
7	Program for allocating memory dynamically for two-dimensional array printing it in spiral manner.
8	Program to create linked list of cell phone with any 3 attributes as data fields and print it
9	Program to create file for storing details of all the items needed for playing any game of your choice also perform display, insertion of new record at any location, deletion of any record
10	Program to implement stack and print MAX data item from it

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INFORMATION TECHNOLOGY

III SEMESTER

IT2207	Computer Architecture and Organization	L=3	T=0	P=0	Credits=3

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
Student will able to 1. Study the fundamentals and advance concepts of computer architecture and organization. 2. understand control unit operations and performances issues. 3. Study and apply the different arithmetic operation including the algorithms & implementation for fixed-point and floating-point numbers. 4. Study the hierarchical memory system including cache memories and virtual memory.	**Students will be able to** 1. Describe the fundamentals and advance concept in computer organization and its relevance to classical and modern problems of computer design. 2. Write control sequence for Instructions also understand performances issue in processor and memory. 3. Understand the different methods used by processor for arithmetic calculations, perform arithmetic operations and understand the storage format for floating point numbers. 4. Understand the storage of computer system, how to speed up the operation of system, different issues of cache, main memory and virtual memory.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Describe the fundamentals and advance concept in computer organization and its relevance to classical and modern problems of computer design.	3												3	
CO2	Write control sequence for Instructions also understand performances issue in processor and memory.	3	2											3	
CO3	Understand the different methods used by processor for arithmetic calculations ,perform arithmetic operations and understand the storage format for floating point numbers	3	3											3	
CO4	Understand the storage of computer system, how to speed up the operation of system, different issues of cache, main memory and virtual memory.	3	2											3	

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INFORMATION TECHNOLOGY

III SEMESTER

IT2207	Computer Architecture and Organization	L=4	T=0	P=0	Credits=4

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Unit No.	Contents	Max. Hrs.
1	Basic Structure of Computer Hardware and Software: Functional Units, Basic Operational Concepts, addressing methods and machine program sequencing : Memory Locations , addressing and encoding of information, Main memory operation . Instruction Format, limitations of Short word- length machines, High level language considerations	7
2	Processing Unit: Some fundamental concepts, Single, two, three bus organization, Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instruction, Instruction sequencing, addressing modes. Case study – instruction sets of some common CPUs.	8
3	Hardwired Control : Design Micro-programmed Control: Microinstructions, Grouping of control signals, Micro program sequencing, Micro Instructions with next Address field, Perfecting microinstruction, Emulation, Bit Slices. Case study – design of a simple hypothetical CPU	7
4	Arithmetic: Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction , Arithmetic and Branching conditions, Multiplications of positive numbers, Signed- Operand multiplication, fast Multiplication, Booth's Algorithm, Integer Division, Floating point numbers and operations.	8
5	The main Memory: some basic concepts, semiconductor RAM memories, Memory system consideration, semiconductor ROM memories, Multiple module memories and interleaving, Cache Memory, Mapping techniques, Replacement algorithms, write policies Virtual memories, memory management requirements.	8
6	Computer Peripherals: I/O Devices, I/O device interface, DMA, Interrupt handling Role of interrupts in process state transitions, I/O device interfaces – SCII, USB Introduction to Pipelining, Throughput and speedup, pipeline hazards Introduction to parallel processors.	7

Text Books			
Sr. No	Title	Authors	Publisher
1	Computer Organization and Design: The Hardware/Software Interface	David A. Patterson and John L. Hennessy	5th Edition Elsevier.
2	Computer Organization and Embedded Systems	Carl Hamacher .	McGraw Hill Higher Education 6th Edition
3	Computer architecture and organization	Carl Hamacher	McGraw Hill Higher Education 4th Edition
Reference Books			
1	Computer Architecture and Organization	John P. Hayes,	WCB/McGraw-Hill 3rd Edition
2	Computer Organization and Architecture: Designing for Performance	by William Stallings,	10th Edition Pearson Education.
	Computer System Design and Architecture	Vincent P. Heuring and Harry F. Jordan,	2nd Edition Pearson Education

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

III SEMESTER

IT2208	Lab: Software Lab		L=0	T=0	P=2	Credits=1
Evaluation Scheme	**MSEs***	**TA**	**ESE**	**Total**		**ESE Duration**
	--	**40**	**60**	**100**		**--**

Course Learning Objective	Course Outcomes
1. Understanding data types, data structures, control , and Loop statements in Python. 2. Learn def function definitions, and modules. 3. Learn basic object oriented concepts using Python. 4. Developing applications in Python using customized and built in modules and packages.	After learning the course, the students will be able to 1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python 2. To understand the concepts of functions modules and packages and write complex programs using them. 3. To understand defining and handling Python objects and develop classes required for the given application 4. To develop a useful application in Python.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python	3													
CO2	To understand the concepts of functions modules and packages and write complex programs using them.	3	1												
CO3	To understand defining and handling Python objects and develop classes required for the given application	3	1												
CO4	To develop an useful application in Python	2	2	2	1	1				2			2	1	1

Contents:

Module 1: Introduction: Build-in Data types: Data type & Variables, Python numbers, Python Strings, Python built in data structures: Lists, Dictionaries, Tuples, Sets, Arrays. Datatype conversion. Statements: Assignment statement, import statement, print statement, input statement, Python Control Statements: if, if – else, elif statements, Loop statements: For, while, continue and break, try and except statement, raise, with statements, case statement.

Module 2: Python Functions, Modules and Packages: The def statement, returning values, parameters, arguments, local variables, global variables and global statement, doc strings for functions, Mathematical Function, Generating Random numbers, File Handling.

Module 3: Python Object and Classes: A simple class, defining methods, member variables, The constructor, calling methods, adding inheritance, class variables, class methods and static methods, Interfaces, New-style classes, Doc strings for classes, Private members, Python Operator Overloading, Python inheritance and polymorphism, Exception Handling, Python Modules.

Module 4: Developing applications in Python using built in and customized modules and packages.

III SEMESTER

IT2208	Lab: Software Lab		L=0	T=0	P=2	Credits=1
Evaluation Scheme	MSEs*	TA	ESE	Total		ESE Duration
	--	40	60	100		--

Sr. .	Topics to be Covered	Sample Problem Statement
1.	Demonstration of Build-in Data types: Data type & Variables, Python numbers	Write a Python program to compute the roots of a quadratic equation
2.	Demonstration of Python Lists.	Write a Python program to perform following operations: **i)** Insertion of element in a given list **ii)** Deletion of element from the given list
3.	Demonstration of different Statements: Assignment statement, import statement, print statement, input statement	Write a Python program to find square root of a number
4.	Demonstration of control statements: if, if – else, elif statements	Write a Python program to enter day number (1-7) and print the corresponding day of week name using if else. (e.g 5 then Friday)
5.	Demonstration of Loop statements: For, while, break, continue	Write a Python program to print all prime numbers from 1 to 100 (using nested loops, break and continue)
6.	Demonstration of try and except statement, raise, with statements, case statement	Write a Python program which take character as input and determine about vowels and consonants using case statement.
7.	Demonstration of Python Functions: The def statement, returning values, parameters, arguments	Write a Python program using user defined function to find the sum of following series. 1/1! + 2/2! + 3/3! + ……1/N!
8.	Demonstration of Python Mathematical Function	Write a Python Program to implement some mathematical functions
9.	Demonstration of Python File Handling	Write a Python program to read data from "Input.txt" file using File Input Class and write output to "Output.txt" using File Output class.
10.	Demonstration of Python Object and Classes: A simple class, defining methods, member variables	Write a program to define a class Employee with four data members such as Emp_name, Emp_id, Salary and department_id. Define appropriate methods to initialize and display the values of data members. Also calculate Gross salary of employee based on Basic Salary, TA, DA and HRA of employee
11.	Demonstration Python inheritance	Create a class Account that stores the customer name, account, number and type of account. From this derive the classes Current-acct and Saving-acct to make them more specific to their requirement. Include necessary methods in order to achieve the following tasks: (a) Accept deposit from a customer and update the balance. (b) Display the balance (c) Compute and deposit interest. (d) Permit withdrawals (e) Check the minimum balance, impose penalty, if necessary and update the balance
12.	Demonstration of Python Exception Handling.	Write a program to implement Exception handling in Python.
13	Building Application	Develop some useful application in Python

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(Accredited 'A' Grade by NAAC with a score of 3.25)

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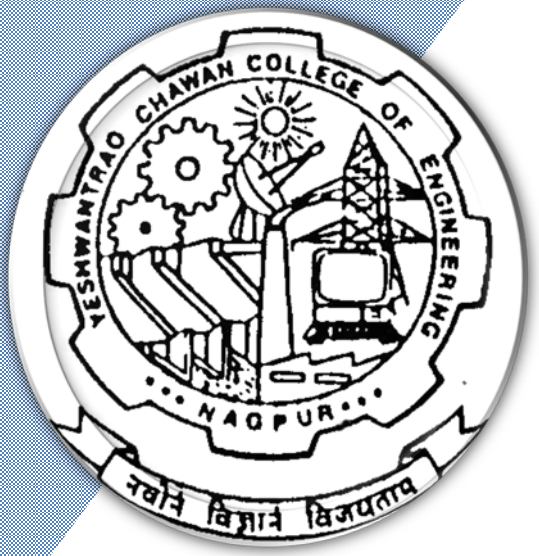

Bachelor of Engineering

SoE & Syllabus 2018

4th Semester

Information Technology

28 June 2019

IV Semester
GE2206 – Discrete Mathematics and Probability Theory

Objectives	Outcomes Students will be able to
To introduce the concept of Set theory and functions	explain the basic concept of classical sets, fuzzy sets, Relations, functions and logical methods.
To make aware of various algebraic structures	identify the nature of different algebraic structures such as Group, Ring, field
To understand the concept of Probability distribution	Determine the probability functions of one and two random variables
To introduce the concept of Mathematical Expectation	Calculate the Statistical parameters for random variables

Unit I:

Mathematical Logic and Set Theory: Statement and Notation: Negation, Conjunction, Disjunction, Tautologies, Truth Tables, Basic Concepts of Set Theory, Inclusion & equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets , , mathematical induction. Propositions, Predicate logic, formal mathematical systems. **(7 hours)**

Unit II:

Relations and Functions: Relation and Ordering, Properties of Binary in a set, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial order relations, Partially Ordered sets, Function (Definition and Introduction), Composition of functions, Inverse Functions, Characteristics function of a set. **(6 hours)**

Unit III:

Group Theory: Groups (Definitions and Examples) Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups, Codes and Group Codes. Semi groups and Monoids (definitions and examples).Homomorphism of semi groups and monoids, Subsemi groups and monoids.

(7 hours)

Unit IV:

Rings (Definitions and Examples): Integral domain, field , ring homomorphism

Fuzzy Sets and Fuzzy Logic: Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations. **(6 hours)**

IV Semester
GE2206 – Discrete Mathematics and Probability Theory

Unit V:

Random variables and probability distribution: Random variables: discrete and continuous; probability density function of one and two variables; Probability distribution function for discrete and continuous random variables(one and two variables), Joint distributions, conditional distributions.

(6 hours)

Unit VI:

Mathematical Expectation: Definition of mathematical expectation, functions of one and two random variables, The variance and standard deviations, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis. **(6 hours)**

Text Books:

1. Discrete Mathematics Structure with application to Computer Science by J. P. Tremblay & R. Manohar ,23rd re-print,2005,Tata McGraw-Hills Publication Company Limited, New Delhi.
2. Probability and Statistics – M R Spiegel, John Schiller, R. AluShrinivasan, 2nd edition, Tata McGraw-Hills Publication Company Limited, New Delhi.
3 Advanced Engineering Mathematics - by H.K. Dass, 8th revised edition, 2007,S.Chand and Company Limited ,Delhi.

Reference Books:

1. Discrete Mathematics by LipschutzSchaums's Outline series,2ndedition,Tata McGraw-Hills Publication Company Limited, New Delhi.
2 Discrete Mathematical structures :-By Bernard Kolman ,Robert C.Busby,Sharon Ross,3rd edition,2001,Prentice Hall of India, New Delhi.

IV SEMESTER

IT2251	Data Structures and Program Design-II	L=3	T=0	P=0	Credits=3
Evaluation Scheme	**MSEs***	**TA**	**ESE**	**Total**	**ESE Duration**
	30	**10**	**60**	**100**	**3 Hours**
Prerequisite Courses	Data Structures and Program Design-I, Programming Language C				

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Objective	Course Outcome
1. To understand the basic structure concept such as Abstract Data Types, Linear and Non Linear Data structures. 2. To understand the notations used to analyze the Performance of algorithms. 3. To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graph and their representations. 4. To choose the appropriate data structure for a specified application. 5. To understand and analyze various searching and sorting algorithms. 6. To write programs in C to solve problems using data structures such as array, linked lists, queues, trees, graphs, hash tables, search trees.	Upon successful completion of this course, students will be able to: 1. Understand data structures like Tree, Graph, Set, Hash table. 2. Apply appropriate data structures in problem solving. 3. Analyze the performance of operations performed on data structures. 4. Design application by using data structures for real world problems.

Unit No.	Contents	Max. Hrs.
1	Trees, binary trees: representation and traversals, Binary search Trees (BSTs), Height-balanced trees	5
2	Heap tree, Splay trees, B-trees, B+ trees. Applications of trees	7
3	Graphs: representation & traversals. Spanning trees, shortest path algorithm, topological sort	5
4	Sets: Representation and Operations. Sorting and searching	6
5	Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.	5
6	Hash table, File Organization, external sort	5

Text Books/Reference Book

Sr. No.	Title	Authors	Publisher
1	The C Programming Language	Brian W. Kernighan and Dennis M. Ritchie	Prentice Hall of India
2	Programming in ANSI C	E. Balaguruswamy	Tata McGraw-Hill
3	How to Solve it by Computer	R. G. Dromey	Pearson Education
4	Data Structures & Program Design in C	Robert Kruse, G. L. Tondo and B. Leung	PHI-EEE
5	Data Structures	Seymour Lipschutz	Tata McGraw-Hill
6	Fundamentals of Data Structures in C	Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed	W. H. Freeman and Company.

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

IV SEMESTER

IT2252	Lab: Data Structures and Program Design-II	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses	Data Structures and Program Design-I, Programming Language C				

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
1. To understand the basic structure concept such as Abstract Data Types, Linear and Non Linear Data structures. 2. To understand the notations used to analyze the Performance of algorithms. 3. To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graph and their representations. 4. To choose the appropriate data structure for a specified application. 5. To understand and analyze various searching and sorting algorithms. 6. To write programs in C to solve problems using data structures such as array, linked lists, queues, trees, graphs, hash tables, search trees.	Upon successful completion of this course, students will be able to: 1. Understand data structures like Tree, Graph, Set, Hash table. 2. Apply appropriate data structures in problem solving. 3. Analyze the performance of operations performed on data structures. 4. Design application by using data structures for real world problems.

Sr. No	Problem Statements
1	Program for displaying nodes of linked list in reverse order using recursion
2	Implement queue using linked list
3	Program to Print the Alternate Nodes in a Linked List using Recursion
4	Program based on Binary tree: creation, display
5	Program based on Binary tree: deletion and traversals
6	Program for Heap sort
7	Program for inserting a key and searching a key in tries
8	Program for printing BFS and DFS sequence of graph
9	Program for detecting presence of cycle in given graph G
10	Program for printing topological sort of given graph

IV SEMESTER

IT2253	Computer Networks	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Objective	Course Outcome
Student will study: 1. To master the terminology and concepts of the OSI reference model and the TCP-IP reference model and types of computer networks. 2. To build an understanding of the fundamental concepts of hardware, software and types of transmission media used in computer networking. 3. To study the concepts of data link layer protocols, network interfaces, and design/performance issues in computer networks. 4. To become familiar with IP Addressing, routing algorithms, basics of Internet and network security.	After completion of the course students will be able to: 1. Students will able to explain and visualize the different aspects of networks, protocols and network design models. 2. Students will able to illustrate the different of hardware, software and types of transmission media used in computer networks. 3. Students will able to analyze various Data Link layer design issues and select appropriate routing algorithms for a network. 4. Students will able to analyze the important aspects and functions of transport layer, application layer and Cryptography in computer networking.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	Students will able to explain and visualize the different aspects of networks, protocols and network design models.	1	2	-	3	-	-	-	-	-	-	-	-	3	-
CO2	Students will able to illustrate the different of hardware, software and types of transmission media used in computer networks.	-	1	-	2	-	-	-	-	-	-	-	-	3	
CO3	Students will able to analyze various Data Link layer design issues and select appropriate routing algorithms for a network.	-	-	1	2	3	-	-	-	-	-	-	-	3	
CO4	Students will able to analyze the important aspects and functions of transport layer, application layer and Cryptography in computer networking.	1	1	-	2	-2	-	-	-	-	-	-	-	3	

IV SEMESTER

IT2253	Computer Networks	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Unit No.	Contents	Max. Hrs.
1	The use of computer networks, LAN"s, MAN"s, WAN"s. topologies and their characteristics, wireless networks, protocol hierarchies, design issues for layers, interfaces and services, connection oriented and connectionless services, service primitives relationship of services to protocols. The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference model	05
2	Physical layer: theoretical basis for data communication, Guided transmission media, wireless transmission: electromagnetic spectrum, radio transmission, infrared transmission. Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	05
3	Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA	07
4	Network layer: design issues, Classful and classless Internet Addresses, subnet addressing, implementation of subnet with mask, supernetting, Address block and CIDR notation, examples. Routing algorithms, congestion control algorithms, quality of service, internetworking, network layer in Internet: IP protocol, Internet control protocols, OSPF, BGP, Internet multicasting	09
5	**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm. Performance issues: performance problems in networks, network performance measurement.	08
6	**Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Network security: cryptography, introduction to symmetric and public key algorithms, digital signatures, authentication protocols, e-mail and web security.	06

IV SEMESTER

IT2254	Lab: Computer Networks	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	--	40	60	100	--

Objective	Course Outcome
Students will be able to: 1. Study the services and features of the Computer networks. 2. Study Errors in data transfer and configuration of the DNS and DHCP Servers	Students will be able to: 1. Understand and describe the services and features of the Computer networks. 2. Detect Errors in data transfer and configure the DNS and DHCP Servers

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
	Students will be able to Understand and describe the services and features of the Computer networks .	**2**	**2**											**1**	
	Detect Errors in data transfer and configure the DNS and DHCP Servers	**2**	**2**		**1**	**3**								**2**	
		2	**2**		**1**	**3**								**1**	

Sr. No	Problem Statements
1.	To Study different types of network & networking commands in Linux.
2.	To Configure DNS Server using CISCO Packet Tracer
3.	To implement client-server application using java network programming.
4.	Write a program to perform Bit stuffing.
5.	Write a program to implement CRC.
6.	Write a program to implement Hamming Code.
7.	To Configure DHCP using CISCO Packet Tracer
8.	To Configure RIP server using CISCO Packet Tracer.
9.	To Configure Simple VLAN server using CISCO Packet Tracer.
10.	To Study campus networking of YCCE.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

BE SoE and Syllabus 2018

INFORMATION TECHNOLOGY

IV SEMESTER

IT2255	Operating Systems	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses	ITCP, Data Structures, CAO				

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Course Learning Objective	Course Outcomes
Student will study : 1. To understand the role, components, and designing issues associated with operating systems. 2. To understand processes and threads, CPU scheduling algorithms, and process synchronization mechanisms 3. To comprehend the concepts of memory management including virtual memory. 4. To understand issues related to file system interface and implementation, and disk scheduling.	**After undergoing this course students will be able to** 1. Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality. 2. Explain various OS mechanisms and policies for managing system resources. 3. Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments. 4. Evaluate the performance of algorithms for managing various OS resources.

Unit No.	Contents	Max. Hrs.
1	**Introduction to OS:** evolution of OS, basic hardware support necessary for modern operating systems, Layered Structural of OS, Services provided by OS, system calls, Dual mode of operation. Input-output Management : Basics of I/O hardware, Polling, Interrupts and DMA.	(6)
2	**Process management:** introduction, process control block, process states, process context switch, introduction to threads, CPU scheduling, goals of scheduling, Algorithmic evaluation of CPU scheduling algorithms.	(5)
3	**Interposes communication:** process cooperation and synchronization, race condition, critical region, mutual exclusion and implementation, semaphores, classic problems of Synchronization using semaphores.	(6)
4	**File systems : introduction,** Access methods, Directory Structure disk space management and space allocation strategies, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, Selecting a disk scheduling algorithm.	(5)
5	**Memory management techniques: -**contiguous allocation, static and dynamic partitioning, and non-contiguous, paging and segmentation, translation look aside buffer (TLB) and overheads.	(5)
6	**Virtual memory:** demand paging, page replacement algorithms, thrashing, working set model. **Deadlocks**: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock.	(7)

Text Books			
Sr. No.	**Title**	**Authors**	**Publisher**
1	Operating system concepts	8th Edition	Silberchatz & galvin
2	Operating System	5th Edition	William Staling
Reference Books			
1	Modern operating systems	2nd Edition	A.S. Tanenbaum
2	Operating system concepts	2nd Edition	Milan MilenKovic

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

IV SEMESTER

IT2256	Lab: Operating Systems		L=0	T=0	P=2	Credits=1
Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration	
	--	40	60	100	--	

Course Learning Objective	Course Outcomes
To understand the working of Operating System services, algorithms and mechanism practically .	**Students will be able to:** 1. Understand the advanced OS commands 2. Understand the working of processes and threads and their synchronization practically. 3. Understand various algorithms and techniques used by OS for managing resources through software simulation.

Sr. No	Problem Statements
1	Study of Advanced Linux shell commands (Process management, Memory management, Networking, etc.)
2	Study of Window task manager (about its applications, processes, services, networking, performance etc.)
3	Write a program that illustrates the creation of child process using fork system call. Each child and parent Processes perform different task.
4	Write a multithreaded program to multiply two given matrices.
5	Simulate any two of the following CPU Scheduling Algorithms (One each from preemptive and non-preemptive types) : FCFS, SJF, SRTN, Round Robin, Preemptive priority, Non-preemptive priority
6	Simulate any one of the following Dynamic Memory allocation algorithms First Fit, Best Fit, Worst Fit.
7	Simulate any one of the following Page replacement algorithms: FIFO, LRU, Optimal
8	Write a program to perform Inter-Process-Communication using shared memory OR, pipes OR message queues.
9	Write a program that gives a deadlock and starvation free solution to the Dining philosophers problem using semaphores
10	Write a program to simulate Banker's Deadlock avoidance algorithm.

IV SEMESTER

IT2257	Theory of Computation	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Objective	Course Outcome
1. To understand the basic properties of formal languages & Finite Automata, regular expression and Regular Grammar 2. To study of different types of grammars and the properties of Context Free Grammar 3. To understand the basic properties of CFL & Designing of Push Down Automata 4. To understand the basic properties of Turing machine and study of Recursive Language , undeciadibility, post Correspondence problem & Recursive enumerable language	**After completion of the course students will be able to:** 1. To apply basic properties of formal languages & to construct Finite automata, to write regular expression and Regular Grammar. 2. To analyze & design different types of Grammars. 3. To apply properties of CFL & design of Push Down Automata 4. To analyze & design Turing machine & demonstrate basic concept of Recursive Language, undeciadibility, post Correspondence problem & Recursive enumerable language

Unit No.	Contents	Max. Hrs.
1	Introduction: Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Finite Automata: Design of Finite Automata, Acceptance of strings and languages, Deterministic Finite Automation , Non-Deterministic Finite Automation, Equivalence between NFA and DFA , NFA with ε-transition, Minimization of FA.	05
2	Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma for regular languages, closure properties of regular sets, properties of regular languages, Chomsky hierarchy of languages, Regular grammars, Right linear and left linear regular grammars, interconversion, Equivalence between regular grammar and FA, Interconversion between RE and RG.	05
3	Context free grammar, Derivation trees (Parse tree), Syntax tree , Ambiguous Grammar, Context Free Language (CFL), Closure properties of CFL, Simplification of CFG, Normal Forms of grammar: Chomsky Normal Form (CNF), Greibach Normal Form (GNF), CYK algorithm.	07
4	Push down automata, definition and model, acceptance of CFL by empty Stack and by final state, Design of PDA for the CFL, equivalence CFG and PDA, Inter conversion, DPDA & NDPDA.	09
5	Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive enumerable language, Recursive Language, Properties of Recursive enumerable language, Variants of Turing machines, non deterministic TMs and equivalence with deterministic TMs, context sensitive language (CSG), Linear bounded automata.	08
6	Undecidability: Church-Turing thesis, Undecidable Problems related to Recursive enumerable language and Turing Machine, post correspondence problem (PCP), Universal Turing Machine, The universal and diagonalization languages, reduction between languages and Rice's theorem, Recursive function: Basis functions and operations on them. Bounded minimization, unbounded minimization, preemptive recursive function and μ recursive function.	06

		June 2019	1.00	Applicable for AY2019-20 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

IV SEMESTER

IT2257	Theory of Computation	L=0	T=0	P=2	Credits=1

Evaluation Scheme	MSEs*	TA	ESE	Total	ESE Duration
	30	10	60	100	3 Hours
Prerequisite Courses					

*** MSEs = 3 MSEs of 15 Marks each will be conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment**

Text Books

Sr. No.	Title	edition	Authors	Publisher
01	T1: Introduction to Automata Theory, Languages and computation	2nd edition, 2000	John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman	Pearson Education Asia
02	T2: Introduction to languages and the Theory of Automata	3rd edition, 2003.	John C. Martin	Tata McGraw Hill

Reference Books

1	R1: Elements of the Theory of Computation		Harry R. Lewis and Christos H. Papadimitriou	Pearson Education Asia
2	R2: Introduction to the Theory of Computation		Michael Sipser	PWS Publishing
3	R3: Theory of Computation	2008	O.G. Kakde	USP

Nagar Yuwak Shikshan Sanstha's

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(Accredited 'A' Grade by NAAC with a score of 3.25)

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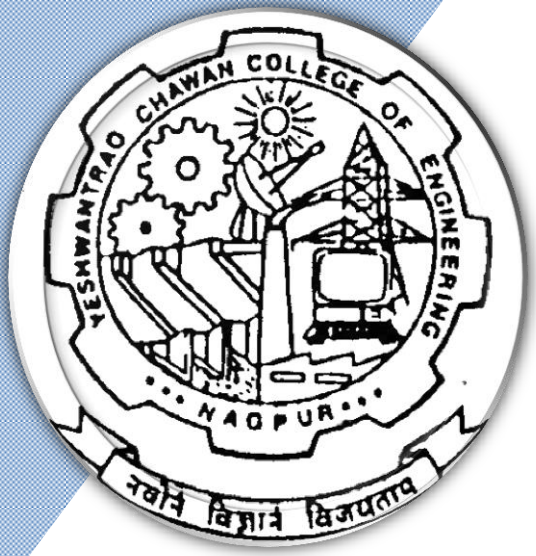

Bachelor of Engineering
SoE & Syllabus 2018
5th Semester
Information Technology

28 June 2020

V Semester

IT 2301 - Data Base Management Systems

Objective	Course Outcome
The student should be able to 1) Understand Database management system's basic operations & design process using ER, EER diagram, SQL and with the use of Normalization. 2) Understand Transaction with ACID properties and their implementation. 3) Understand various storage structures, Query Processing and query optimization techniques to build a robust database management system. 4) Understand concurrency control mechanism using various concurrency control protocols.	**On completion of this course, the student will be able to** 1) To obtain sound knowledge in the theory, principles and applications of database management system. 2) Design and develop data model given their specifications and within performance and cost constraints. 3) Acquire and understand new knowledge, use them to develop data centric application and to understand the importance of lifelong learning. 4) Perform experiments in different disciplines of database management system.

Unit No.	Contents	Max. Hrs.
1	Introduction to Database Management System: General File System vs. DBMS, Data Abstraction, Data Independence, Keys, Data Modeling using the Entity Relationship(ER) Model, The enhanced Entity Relationship(EER) model.	8
2	Relational Model: Structure of Relational Databases, The Relational Algebra and Relational Calculus(TRC & DRC) Introduction to SQL Programming: (DDL, DML, Joins, Nested Queries/Sub Queries/Inner Queries) Integrity Constraints.	7
3	Database Design: Functional Dependency and Normalization for Relational Databases, Desirable properties of decomposition.	7
4	Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions. Query Optimization: Overview, Transformation of Relational Expressions, Estimating Statistics of Expression Results.	8
5	Transaction Processing: Introduction to Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels.	8
6	Concurrency control Techniques: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, and Timestamp-Based Protocols. Data Control Language: GRANT, REVOKE; Concept of Triggers and Views.	8

V Semester

IT 2301 - Data Base Management Systems

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Fundamentals of Database System	5th Edition(2006)	Elmasri & Navathe	
2	Database System Concepts	6th Edition, (2010)	Abraham Silberschatz, Henry F. Korth and S. Sudarsha	McGraw-Hill Education
3	Database Management Systems	Second Edition	Raghu Ramakrishnan, Johannes Gehrke	McGraw-Hill, 2002

Reference Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Database in Depth – Relational Theory for Practitioners		C.J. Date	O`Reilly Media, 2005
2	Database design, Application Development and Administration	4th Edition(2008)	Michael Mannino	

V Semester

IT 2302- Data Base Management Systems Lab

List of Practical's

Sr. No..	Problem Statements
1	Database design using E-R Model for: Payroll processing system, Banking system Library Information System Student Information System, etc.
2	Mapping of E-R model to relational Schema and creation of Tables using DDL (Data DefinitionLanguage).
3	Modification of Database objects using DDL and DML
4	Querying the Database based on various inbuilt functions (Date Function, Numeric Function, Character Function, Conversion Function, Miscellaneous Function, etc.).
5	Querying the Database based on Set, Arithmetic and Logical operator.
6	Implementation of Joins(all types).
7	Queries based on Data Grouping Restricting and sorting.
8	To create and manipulate various database objects of the Table using Views:
9	Querying the Database based on to create triggers for various events such as insertion, updation, etc.
10	Exploring NOSQL Database.

V Semester
IT 2303 - Software Engineering
(Self-learning- online)

Objective	Course Outcome
The student should be able to 1. To understand the different Software Process Model and Architectural Style for Developing a Software 2. To acquire knowledge of Different Software Testing Techniques 3. To understand the various UML Diagrams 4. To understand different Tools and Techniques for Engineering Practice.	**On completion of this course, the student will be able to** 1. Analyze and evaluate the different software process model and appropriate architectural style while developing a software 2. Understand and Apply the software testing techniques in a variety of ways to test the software. 3. Analyze and design various UML diagram and UML based design and analysis with the help of various diagrams. 4. Demonstrate an ability to use the techniques and tools necessary for engineering practice

Unit No.	Contents: NPTEL Videos As Per Syllabus	Max. Hrs.
1	1.Introduction to Software Engineering ,2 Introduction to Software Engineering,3 Overview of Phases 4 Overview of Phases,5 Requirements Engineering / Specification,25 Software Evolution, 8 Systems Modeling Overview.	8
2	17 Architectural Design,16 Class and Component Level Design, 9 Process Modeling - DFD , Function Decomp,10 Process Modeling - DFD, Function Decomp ,11 Data Modeling - ER Diagrams, Mapping , 15 Design Patterns, 14 Software Design - Primary Consideration, 26 Agile Development.	8
3	18 Software Testing – I, 19 Software Testing – II.	6
4	21 Software Metrics and Quality, 22 Verification and Validation, 29 Introduction to Project Management 30 Project Scope Management, 31 Project Time Management,32 Estimation – I,33 Estimation - II 34 Project Quality Management,35 Quality Management Systems – I,36 Quality Management Systems 37 Project Configuration Management,38 Project Risk Management,39 Other PM Processes, 13 Production Quality Software – Introduction.	7
5	12 Data Modeling - ER Diagrams, Mapping.	7
6	23 Case Study,24 Case Study, 27 Software Reuse,28 Reuse Continued	6

Semester

IT 2303 - Software Engineering

(Self-learning- online)

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Software Engineering -A Practitioner's Approach	Seventh Edition	Roger S. Pressman	Pressman
2	Object Oriented Software Engineering	2nd Edition,2005	Lethbridge and Pearson	Pearson Education

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Software Engineering	10th Edition, 2014,	I. Somerville	Oxford University Press
2	An integrated approach to software Engineering'	3rd Edition,1991,	Dr. Pankaj Jalota	Narosa Pub

Reference: NPTEL Guru Course Name: Software Engineering

Instructors: Prof. Rushikesh K Joshi , Prof. Umesh Bellur , Prof. N. L. Sarda, IIT Bombay

http://122.15.102.21/LocalGuru

Username : ycce, Password: ycce

http://122.15.102.21/LocalGuru/listLectures.php?cid=1daf52be74f11d45&lid=&opt=&pg=1

V Semester

PE-1: IT 2311 - Web Programming

Objective	Course Outcome
The student should be able to 1. Get familiar with basics of HTML, HTML tags, DHTML CSS. 2. Get familiar with client server architecture and able to develop a web application using java technologies 3. Get familiar with markup languages with their structures and syntax. 4. To get familiarised with PHP frame work	On completion of this course, the student will be able to 1. Understand the different tags of HTML and Implement interactive web pages using HTML , DHTML and CSS. 2. Understand client server architecture and Develop interactive web pages using java script and client and server side programming. 3. Understand the concept of Markup languages and Make the use of mark up languages in development of web pages. 4. Understand the concepts of PHP and Develop web applications using PHP

Unit No.	Contents	Max. Hrs.
1	Creation of web pages: HTML tags, special characters, images, tables, forms, the hyperlinks, Frames	8
2	Dynamic HTML (DHTML): Introduction, Cascading Style Sheets (CSS), DHTML Document Object Model and Collections	8
3	Scripting Languages:- Java Script objects and forms, server side and client side scripting languages	6
4	XML:XML basics, understanding mark-up languages, structures and syntax, valid Vs. Well formed XML, DTD (document type Definitions) classes, Element Type Declaration, Attribute Declarations, Limitations of DTDs, XML processor, Introduction to Schema, Complex Types, Extensible Style sheet Language Transformations (XSLT),Basics of Parsing	7
5	The importance of being asynchronous, Blocking vs. non-blocking code, Server-side JavaScript, What is Node.js?, Why use Node.js?,Features, Process Model, Setup Node.js Development Environment, Node.js Basics, Node.js Module, File System	7
6	Introduction to AngularJS, AngularJS Expressions: Numbers, Strings, Objects, Arrays, Expressions using {{ }} and ng-bind. Modules: Creating a module, adding a controller & directive, myApp.js, myCtrl.js, Loading library. Directives: Data Binding, ng-init, ng-repeat, ng-app & ng-model directives, custom directives.2 way binding, Validating User Input, Status, ng-empty, ng-touched, ng-valid, ng-pending. Data Binding: Synchronization between model and view. AngularJS Controllers: ng-controller, Controller Methods, External Files.Scope: $scope, understanding the scope, $rootScope	6

V Semester

IT 2311 - PE-1: Web Programming

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	The Complete Reference HTML and XHTML		Thomas A.Powell	McGraw Hill Pub
2	Learning angular JS		Dayley, Brad Dayley	

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites		Robin Nixon	

V Semester

IT 2312 - PE-1: Lab Web Programming

List of Practical's

Sr. No..	Problem Statements
1	Program based on HTML Tags
2	Program based on Table Tag
3	Program based on HTML Forms
4	Program based on CSS
5	Program based on JavaScript
6	Program based on JavaScript (Advanced)
7	Program based on Node JS(Linear)
8	Program based on Node JS(Advanced)
9	Program based on Angular JS (Linear)
10	Program based on Angular JS (Advanced)

V Semester

IT 2313 - PE-1: Data Analysis and Statistics

Objective	Course Outcome
The student should be able to 1. Know basics of data analysis using statistics and probability. 2. Become familiar with different statistical methods. 3. Determine parameters given in problem statement, analyze it and find the solution and Draw inference from obtained solutions and know applications of data analysis. 4. Use and explore a tool to perform data analysis using it	On completion of this course, the student will be able to 1. Apply fundamental concepts of statistics and probability for data analysis(PO1-3) 2. Apply appropriate statistical methods on simple datasets(PO2-3) 3. 3.Formulate and solve problems in a systematic manner and Interpret output obtained from statistical analysis on datasets.(PO2-3, PO4-3) 4. Obtain hands on experience with some popular software (like R)for analysis and visualization of data (PO2-3,PO4-3,PO5-3)

Unit No.	Contents	Max. Hrs.
1	INTRODUCTION TO STATISTICS & PROBABILITY: Statistics,–Definition, Types. Types of variables–organizing data , Descriptive Measures. Basic definitions and rules for probability, conditional probability independence of events, Baye's theorem, and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions.	6
2	SAMPLING DISTRIBUTION: Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques.	7
3	ESTIMATION THEORY: Estimation: Point and Interval estimates ,confidence intervals ,calculating interval estimates for population parameters of large sample and small samples, determining the sample size	6
4	TESTING OF HYPOTHESIS: Hypothesis testing: statistical hypothesis null hypothesis, tests of hypothesis and significance, type I and type II errors, one tailed and two tailed tests , p-value one sample tests for means and proportions of large samples (z-test), one sample tests for means of small samples (t-test), Chi-square tests for goodness of fit. Analysis of variance.	7
5	NON-PARAMETRIC METHODS: Sign test for paired data. Rank sum test. Mann –Whitney U test and Kruskal Wallis H test. One sample run test, rank correlation. Kolmogorov-Smirnov –test.	7
6	REGRESSION and CORRELATION: Estimation of regression line by least square method, linear and multiple regressions, Correlation analysis, Time series analysis: components of Time series, Variations in time series, trend analysis.	7

V Semester

IT 2313 - PE-1: Data Analysis and Statistics

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Probability and Statistics ,	Third edition .	Murray R. Spiegel, John J.Schiller, R AluSrinivasan	Mc Graw Hill education
2	Statistics for Management, ,	7th edition	Levin R.I. and Rubin D. S.	Prentice Hall India Pvt.Ltd., New Delhi, 2001

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Business forecasting	8th Edition	John Hanke,Dean W. Wichern	Prentice Hall India

V Semester

IT 2314 - PE-1:Lab Data Analysis and Statistics

List of Practical's

Sr. No..	Problem Statements
1	Introduction to R, R Objects , R datasets, packages , R installation and executing basic commands in R
2	Using objects in R- vectors, lists, arrays ,matrices ,tables ,data frames .
3	Data import / export using R
4	Demonstrate Statistical functions using R- Measurement of Central tendency and Dispersion and frequency distribution
5	Demonstrate Finding probability and probability distribution using R
6	Demonstrate sampling and sampling distribution using R
7	Demonstrate Hypothesis testing using R
8	Demonstrate linear and multiple Regression using R
9	Demonstrate Visualization using R

V Semester

IT 2315 - PE-1: Customer Relationship Management

Objective	Course Outcome
The student will study 1. To understand the principles of CRM and concepts of Salesforce CRM 2. To Understand object, Tabs and Security Features in Salesforce CRM 3. To Understand Automated Business Process and Approval Process in CRM 4. To Understand Advanced Featured in Salesforce CRM	On completion of this course, the student will be able to 1. Analyze and Evaluate the CRM and Concepts of Salesforce CRM 2. Understand and Apply the Security Features of Salesforce CRM 3. Analyze and Evaluate the Automated Business Process and Approval Process in CRM 4. Understand and Apply the Advanced Features in Salesforce CRM

Unit No.	Contents	Max. Hrs.
1	**Introducing the Force.com Platform**. - Introduction to the Force.com Platform. The Basics of an App's User Interface. The Benefits of a Force.com Data-Centric, Collaborative Apps, The Technologies Behind a Force.com Platform App, Multitenant Architecture, A Metadata-Driven Development Model, Apex . Custom User Interface Mobile, AppExchange.	7
2	**Objects and Tabs:** Introduction to Objects ,The Position Custom Object, Introducing Tabs , Setup Detail Pages and Related Lists ,Introduction to Fields , Advanced Fields, Data Validation, and Page Layouts , Adding Advanced Fields , Introduction to Picklists , Field Dependencies , Dependent Picklist ,Custom Formula Fields , Dynamic Default Values , Validation Rules ,Page Layouts , Page Layout Editor Group Fields Edit Field Properties , Page Layouts , Compact Layouts.	7
3	**Relationships:** Introduction to Relationship Custom Fields, Page Layout Properties, Record Highlights, Introduction to Search Layouts, Additional Search Layouts Managing Review Assessments, Introduction to Roll-Up Summary Fields, Many-to-Many Relationship, Customizing Related Lists in a Many-to-Many Relationship.	6
4	**Securing and Sharing Data:** Controlling Access to Data in App, Data Access Concepts. Controlling Access to Objects, Introduction to Profiles ,Standard Profiles ,Introduction to Permission Sets ,Profiles and Permission Sets ,Introduction to Field-Level Security ,Controlling Access to Records, , Set Org-Wide Defaults, Introduction to Hierarchies ,Comparing Roles, Profiles, and Permission Sets ,Role, Introduction of Sharing Rules , Define a Public Group ,Define Sharing Rules ,Introduction to Manual Sharing , Manual Sharing Rule ,Displaying Field Values and Page Layouts According to Profile ,Overriding Sharing with Object Permissions ,Delegated Administration Groups .	8
5	**Automating Business Processes**: Introduction to Process Builder, Process Builder: A Closer Look Creating a Process That Updates Field Values, Introduction to Queues, Introduction to Scheduled Actions, Email Alerts, Introduction to Email Templates, Introduction to Approvals, Planning for Approval Processes Analyzing Data with Reports and Dashboards, Introduction to Reports, Report Formats	7
6	**Apex and Lightning Aura:** Introduction to Apex, Collections, SOQL and SOSL, DML Operations, Controllers In APEX Using Apex Class and Triggers, Asynchronous APEX, Batch APEX, Introduction to Aura component, attributes handling in Aura component.	7

V Semester

IT 2315 - PE-1: Customer Relationship Management

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Force.com Platform Fundamentals An Introduction to Custom Application Development in the Cloud		Phil Choi, Chris McGuire Caroline Roth	salesforce.com
2	Salesforce Handbook Paperback – 20 Mar 2011		Wes Nolte, Jeff Douglas	Publisher: Lulu.com

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Salesforce CRM: The Definitive Admin Handbook Paperback –	Second Edition	Paul Goodey	Packt Publishing Limited

V Semester

IT 2316 - PE-1:Lab Customer Relationship Management

Objective	Course Outcome
Student will study: 1. To Understand object, Tabs and Security Features in Salesforce CRM 2. To Understand Automated Business Process and Approval Process in CRM	After completion of the course students will be able to: 1. Understand and Apply the Security Features of Salesforce CRM 2. Analyze and Evaluate the Automated Business Process and Approval Process in CRM

List of Practical's

Sr. No..	Problem Statements
1	Demonstrate the Standard and Custom Objects
2	Demonstrate the Page Layout Model
3	Demonstrate the Master Detail and Lookup Relationship
4	Demonstrate the OWD, Object and Record Level Securities
5	Demonstrate the Profiles, Roles and Permission Sets
6	Demonstrate the Sharing and Manual Sharing Rules
7	Demonstrate Field Level Securities
8	Demonstrate the Approval Process and Process Builder
9	Demonstrate the Reports and Dashboard
10	Demonstrate the Standard and Custom Controller
11	Write a Program to Demonstrate the Apex Triger
12	Demonstrate the Lighting Component.

V Semester
IT 2321 - OE-1: Industry 4.0

Objective	Course Outcome
Students will: 1) Able to learn an introduction to Industry 4.0 (or the Industrial Internet) 2) Will able to understand its applications in the business world. 3) Will able to understand Business Model and Reference Architecture in Industry 4) Will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.	After completion of this course: 1) Students will be Understand the basics of IoT and basics of Industry 4.0. 2) Students will be Understand Business Model and Reference Architecture 3) Students will be able to understand the different Business issues in Industry 4.0 and how to solve them. 4) Students will be able to understand the need of Security and Fog Computing and applications of IIoT.

Unit No.	Contents	Max. Hrs.
1	Introduction to IoT: History of IOT, Concepts, Products and Examples. IOT Paradigm, The Layering concepts of IOT, IOT Communication Model, IOT Architecture, IoT Sensing and Actuation, IoT Connectivity, IoT Networking. Introduction to Industry 4.0: History, Concept, The Journey so far: Developments in USA, Europe, China and other countries, The Fourth Revolution, Compelling Forces and Challenges for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory, Globalization and Emerging Issues.	7
2	Basics of Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Life-cycle Management, Augmented Reality and Virtual Reality, Introduction to Artificial Intelligence, Big Data and Advanced Analysis, Cyber-Security in Industry 4.0, Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.	7
3	Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.	6
4	Business issues in Industry 4.0:IIoT case studies, Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world	6
5	Security and Fog Computing: Cloud Computing in IIoT, Fog Computing in IIoT, Security in IIoT. Application Domains: Factories and Assembly Line, Food Industry, Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications),	7
6	Industrial IOT- Application domain: Milk Processing and Packaging Industries, Manufacturing Industries, Virtual Reality Lab, Steel Technology Lab. Facility Management, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries. Facility Management.	7

V Semester
IT 2321 - OE-1: Industry 4.0

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Industry 4.0: The Industrial Internet of Things		Alasdair Gilchrist	Apress
2	Industrial Internet of Things: Cyber manufacturing Systems		Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat	Springer

V Semester

IT 2322 - OE-1: Core JAVA

Objective	Course Outcome
Student will : 1. Learn the Concepts of Java programming language 2. Learn Java's syntax, idioms, patterns, and styles to write simple JAVA program. 3. To develop object centric thinking and to use object oriented features of JAVA to write complex programs. 4. Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them in application development	After completion of the course students will be able to: 1. Demonstrate the understanding of Object oriented concepts. 2. Apply the programming language JAVA efficiently in object oriented software development 3. Able to analyze problem statement and identify appropriate objects and methods 4. Design and implement a small programs using classes

Unit No.	Contents	Max. Hrs.
1	Introduction to Programming Methodologies, Introduction to Object oriented programming, Objects and Classes, Characteristics of OOP, Encapsulation and data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Structured Versus Object oriented programming, Merits and demerits of object oriented methodology, introduction to Java as OOP language	7
2	Building blocks of java, Data types, Variable declarations, operators and Assignments, control structures, Identifying objects and classes, Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control	7
3	Java as OOP language, Other Class Modifiers: static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances)	6
4	Arrays and Strings: Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes	6
5	Exception handling mechanism: Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses	7
6	I/O Streams: Introduction to stream classes, use of stream classes, I/O stream, bytes stream, character stream, pre-defined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files ,transient and volatile modifiers	7

V Semester
IT 2322 - OE-1: Core JAVA

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Thinking in Java		Bruce Eckel	Prentice Hall

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Programming with Java		E Balagurusamy	TATA Mc Graw-Hill
2	Java2CompleteReference		Herbert Schildt	Mc Graw-Hill

V Semester

IT 2331 - OE-2: Introduction to Machine Learning

Objective	Course Outcome
1. To introduce basic concepts of machine learning and explain the relative strengths and weaknesses of different machine learning Methods. 2. To understand the different aspects of supervised learning 3. To understand the concepts of unsupervised learning 4. To learn to apply supervised and unsupervised learning algorithms to solve the problem	After undergoing the course, student will be able to: 1. Understand various models of supervised and unsupervised learning 2. analyze a problem and identify appropriate learning paradigm to solve it. 3. apply supervised learning for the given set of labeled samples and design the model to meet the desired output 4. apply unsupervised learning for the given set of samples, and design the model to meet the desired output

Unit No.	Contents	Max. Hrs.
1	Introduction to machine learning. What Is Machine Learning, Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Supervised and Unsupervised Learning, Reinforcement Learning, Generalization, Overfitting, and Underfitting	6
2	Supervised Learning-1: k-Nearest Neighbors, linear Models, Naive Bayes Classifiers, Decision Trees	6
3	Supervised Learning-2: Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers, The Decision Function, predicting Probabilities, Uncertainty in Multiclass Classification	6
4	Unsupervised Learning: *k*-Means Clustering , Expectation-Maximization Algorithm, Supervised Learning after Clustering , Hierarchical Clustering, Choosing the Number of Clusters	6
5	Design and Analysis of Machine Learning Experiments: Factors, Response, and Strategy of Experimentation, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.	5
6	Advances in Machine Learning: Introduction to learning using Neural networks, shallow and deep networks.	6

V Semester
IT 2331 - OE-2: Introduction to Machine Learning

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Introduction to Machine Learning, Second Edition		Ethem Alpaydın	The MIT Press
2	Introduction to Machine Learning with Python, A Guide for Data Scientists		Andreas C. Müller and Sarah Guido	ORIELLY

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Machine Learning	Tom M. Mitchel	McGraw Hill	
2				

V Semester

IT 2332 - OE-2: Information Security

Objective	Course Outcome
Student will able: 1. To focus on the foundations Computer Security and Threats to security 2. To understand basic concepts of Threats and Intruders. 3. To demonstrate and understand the concepts and application of Communication, Server, System , Network, Internet and cyber security and understanding standards. 4. To know the working of Server security, various System and Application Security, IT Act.	After completion of the course: 1. To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security. 2. Students will be able to understand how to protect information and provide authentication using Communication, Server, System, Network, Internet and cyber security 3. Students will able to effectively use of encryption standards and its implementation. 4. Students will be able to understand various technologies and Internet Application with the understanding of IT Act and its protection.

Unit No.	Contents	Max. Hrs.
1	**Introduction**- Computer Security, History of Computer security, Computer Security Concepts (CIA), The OSI security architecture, security attacks, security mechanism, a model for network security, Threats to security, Computer System Security and Access Controls (System access and data access), Key Terms.	7
2	**Malicious software:** Types of Malicious software, Viruses, Virus countermeasures, Worms , Trojan horse, bombs, Trap doors, spoofs, Email virus, Macro viruses, Remedies, Intruders, vulnerabilities & threats, distributed Denial of service attack and Firewalls.	8
3	**Communication security**- Encryption, classical encryption techniques, Block cipher and data encryptions standards, advance encryption standard.Kerberos,X.509	8
4	**Principles of public key cryptosystems:** RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm. Hash Function: Authentication requirements - authentication functions - message authentication code hash functions - birthday attacks	8
5	**Network and Internet Security-** Transport-Level Security-Secure Socket Layer and Transport Layer Security, SSL Architecture. Electronic Mail security-Pretty Good Privacy, S/MIME.	7

V Semester
IT 2332 - OE-2: Information Security

6	System security and cyber security - Security for network server, web servers, Intrusion detection techniques,intruders,Passwordmanagement,. Cybercrime and Computer Crime Types of Computer Crime, Law Enforcement Challenges, Working With Law Enforcement , Intellectual Property[Types of Intellectual Property, Intellectual Property Relevant to Network and Computer Security], Ethical Issues [Ethics and the IS Professions, Ethical Issues Related to Computers and Information Systems],Security tools, The Information Technology ACT, 2008.	7

Text Books

SN	Title	Edition	Authors	Publisher
1	Cryptography and Network Security		William Stallings	Pearson Education
2	Computer Security: Art and Science		Matt Bishop	Addison Wesley

Reference Books

SN	Title	Edition	Authors	Publisher
1	Introduction to computer Security		Mathew Bishop	Pearson
2	Network Security: Private Communication in a Public World (Prentice Hall Series in Computer Networking and Distributed)		Charlie Kaufman, Radia Perlman, Mike Speciner	Pearson Education
3	Computer Security		Dieter Gollmann	John Wiley & Sons

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A' Grade by NAAC with a score of 3.25)

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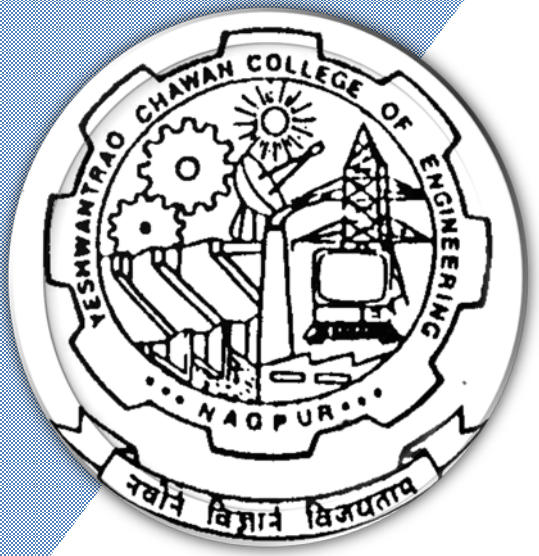

Bachelor of Engineering

SoE & Syllabus 2018

6th Semester

Information Technology

28 June 2019

VI Semester
GE2311 - Fundamentals of Management

Objective	Outcomes Students will be able to
To introduce the fundamentals and legal provision of Management	Explain the Legal provision and Functions of Management.
To introduce the Human Resource and Financial practice of organization	Analyze the role of Human Resource and Financial Management in the organization.
To Introduce the Project Management	Analyze the project life cycles.
To provide knowledge of Marketing Activities of Management	Identify tools and techniques for the marketing of goods and services.

Unit – 1 - Principle of Management

Evolution of Management Thought : Scientific and Administrative Theory of Management , Definition and Concept of Management, Functions of Management : Planning, Organizing, Directing, Coordinating and Controlling, Motivational Theories, Concept of Leadership

UNIT-2: Legal Aspects of Management

The Indian Contract Act, 1872 – Formation of Valid Contract, Discharge of Contract, Quasi Contract, Indemnity and Guarantee. The Indian Partnership Act, 1932- Essentials of Partnership, The Companies Act – Nature and Definition of Company, Registration and Incorporation, Memorandum and Article of Association, Kinds of companies, Winding up of the Company

UNIT-3: Human Resource Management

Human Resource Management-Meaning and Scope, Principles of HRD, Job Analysis – Job Description and Job Specification, Job Enrichment, Job Rotation, Training and Development – Purpose and Methods, Performance Appraisal- Purpose, Procedure and Techniques, Grievance Redressal Procedure .

UNIT-4: Project Management

Concept, Classification and Characteristics of Project, Project Life Cycle, Project Proposal, Tools and Techniques of Project Management, Network techniques - Introduction and Use of CPM &PERT for planning, SWOT Analysis, Project Risk Analysis, Project Control.

UNIT-5: Marketing Management

Marketing Management - Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting

VI Semester
GE2311 - Fundamentals of Management

UNIT-6: Financial Management

Definition & Functions of Finance department, Sources of finance, Types of capital, Profit maximization vs. Wealth Maximization, Functions of Finance Manager in Modern Age, Concept of Risk and Return , Break Even Analysis, Budgets & Budgetary Control, Make or Buy Analysis, Introduction to financial statement – profit and loss A/c and Balance Sheet

Text book and Reference

1. Harold Koontz Ramchandra, Principles of Management, Tata McGrow hills
2. Bare Acts – Indian Contract Act, Indian Partnership Act and Company Law
3. Dr. V.S.P.Rao - Human Resource Management - Text and Cases
4. C.B.Mamoria and S.V.Gankar, A Text book of Human Resource Management,
5. Lock, Gower - Project Management Handbook
6. Ramaswamy V.S. and Namakumari S - Marketing Management: Planning, Implementation and Control (Macmillian, 3rd Edition).
7. Rajan Saxena: Marketing Management, Tata McGraw Hill.
8. Fabozzi - Foundations of Financial Markets and Institutions (Pretice hall, 3rd Ed.)
9. Parameswaran- Fundamentals of Financial Instruments (Wiley India)
10. Bhole L M - Financial Institutions and Markets (Tata McGraw-Hill, 3rd edition, 2003)
11. Khan M Y - Financial Services (Tata Mc Graw Hill, 19

VI Semester
IT2351 - Design & Analysis of Algorithms

Objective	Course Outcome
The student should be able to 1. Study asymptotic notations and recurrence relation. Analysis of iterative and recessive algorithms, complexity of algorithms 2. Use of various algorithmic design techniques in problem solving 3. Performance analysis (time and space complexities) of algorithms in best, worst and average cases. 4. How to synthesize and design efficient algorithms for real world problems	**After completion of the course students will be able to** 1. Understand asymptotic analysis of iterative and recursive algorithms, complexity of algorithms 2. Apply important algorithmic design techniques for problem solving 3. Analyze the performance of algorithms 4. Synthesize and design efficient algorithms for real world problems

Unit No.	Contents	Max. Hrs.
1	Mathematical foundations, summation of arithmetic and geometric series, recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions.	8
2	Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, amortized analysis, External Sorting, lower bound proof.	7
3	Divide and conquer basic strategy, quick sort, merge sort etc. Greedy method – basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc.	7
4	Dynamic Programming basic strategy, multistage graphs, all pair shortest path, optimal binary search trees, Matrix-chain Multiplication, traveling salesman problem.	8
5	Connected components, Branch and bound, Backtracking basic strategy, 8 – Queen's problem, graph coloring, Hamiltonian cycles etc.	8
6	NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, Cook's Theorem, decision and optimization problems, polynomial reduction	8

VI Semester
IT 2351 - Design and Analysis of Algorithms

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Computer Algorithms	2nd Edition	Horowitz, Sahani, Rajsekharan	Silicon Press
2	Introduction to Algorithm	3rd Edition, 2009	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT press
3	Fundamentals of Algorithms	1st edition,1995	Brassard, Bratley	Prentice Hall
4	The Algorithm Design Manual	2nd Edition	Steven S. Skiena	Springer

Reference Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Introduction to the Theory of Computation,	3rd Edition, 2013	Michael Sipser	Cengage Learning
2	Algorithms	1st Edition, 2006	S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani	
3	The art of Computer programming Vol. 3	2nd Edition, 1998	Donald E. Knuth	Addison-Wesley

VI Semester
IT 2352- :Lab- Design & Analysis of Algorithms

Course Learning Objective	Course Outcomes
Students will study : 1. Study of different analysis method 2. Study of different techniques of algorithm like divide and conquer, greedy and dynamic.	Students will be able to: 1. Understand different analysis method and analyze it. 2. Understand different techniques and apply it.

Course Outcomes	Statement	Mapped PO												PSPO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
IT2352.1	Understand different analysis method and analyze it	3													
IT2352.2	Understand different techniques and apply it		3												
IT2352		3	3												

List of Practical's

Sr. No..	Problem Statements
1	Implement and analyze different sorting algorithms.
2	Practical Based on Amortized Analysis
3	Practical Based on Minimum Cost Spanning Tree
4	Practical Based on An Activity Scheduling Problem
5	Practical Based on Single Source Shortest Path
6	Practical Based on Dynamic Programming
7	Practical Based on divide and conquer

VI Semester
IT 2353 - Principles of Compiler Design

Objective	Course Outcome
The student should be able to 1. To study the basic concept of compiler fundamentals & design of lexical analysis 2. To study the different parsing techniques. 3. To study the construction of parsers for different CFG. 4. To study Syntax Directed Translation of different programming language constructs. 5. To study symbol table organization & error detection & recovery 6. To study code optimization & designing of code	**On completion of this course, the student will be able to** 1. Understand different phases of compilation process and lexical analyzer tool "Lex" OR "Flex" 2. Apply parsing techniques to design and implement parsers using YACC /Bison tool 3. Apply syntax directed translation scheme to programming language constructs and analyze errors in lexical and syntactic phase of compiler 4. Apply different optimization techniques in the design of compiler and generate target code

Unit No.		Max. Hrs.
1	Introduction to Abstract Model & Grammar , Introduction to Compilation Process, Compilers & Translators, Phase structure of Compiler, Role of Lex, Design of Lexical Analysis.	6
2	Specifying Syntactic Structure of Programming Language using Context Free Grammars, The role of Parser, Top-down Parsing, and Bottom up Parsing, Predictive Parsers, and Recursive Decent Parser	8
3	Construction of efficient LR Parsers (SLR, CLR & LALR), Canonical Collection of set of items and construction of Parsing table, Implementation of LR Parsing table	7
4	Syntax Directed Translation: Intermediate Code, Postfix notation, Parse tree and Syntax Trees, Three address codes, quadruples, triples, Translation of Arithmetic Expression, Boolean expressions, Control Statements. Array references, Procedure Calls, Declarations, Case Statements, Use of Compiler writing tools (Lex/Flex, Yacc /Biason).	8
5	Symbol Tables: Contents, Representing scope information. Error detection and Recovery: Error handling, Lexical-phase, Syntactic phase and semantic phase	6
6	Introduction to Code Optimization, The principle sources of optimization, Loop optimization, The DAG representation, Introductory Data Flow analysis, Introduction to Code Generation: Object programs, Problems in Code Generation, Register allocation and assignment, Code generation from DAG, Peephole optimization.	8

VI Semester
IT 2353 - Principles of Compiler Design

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Compilers Principles, Techniques & Tools	2nd Edition	Alfred V. Aho , Ravi Sethi , Jeffrey D.	Addison Wesley.
2	Principles of Compiler Design	2nd Edition	Alfred V. Aho ,Jeffrey D. Ullman	Addison Wesley.

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Compiler Design	4th edition	O.G. Kakde	Laxmi Publication
2	Introduction to Compiling Techniques: First Course Using ANSI C, LEX and YACC	2nd Revised edition Edition	J.P. Bennett	Alfred Waller Ltd

VI Semester

IT 2354- : Lab - Principles of Compiler Design

Course Learning Objective	Course Outcomes
Students will study: 1. To study the different phases and passes of compiler design. 2. To write a program using Lex Tool. 3. To write a program using YACC Tool	After completion of the course: 1. Students will be able to understand and apply Lex Tool for the development of program. 2. Students will be able to understand and apply YACC Tool for the development of program.

List of Practical's

Sr. No	Experiments Base On
1	LEX TOOL
2	YACC TOOL

VI Semester
PE-II: IT 2361 - Machine Learning

Objective	Course Outcome
The student should be able to 1. To introduce basic concepts of machine learning and explain the relative strengths and weaknesses of different machine learning Methods. 2. To understand the different aspects of supervised learning 3. To understand the concepts of unsupervised learning 4. To understand different methods of evaluation of machine learning models	After undergoing the course, student will be able to: 1. Understand various models of supervised and unsupervised learning 2. analyze a problem and identify the machine learning algorithm appropriate for its solution 3. apply supervised learning for the given set of labelled samples and design the model to meet the desired needs 4. apply unsupervised learning for the given set of samples, and design the model to meet the desired needs

Unit No.	Contents	Max. Hrs.
1	**Introduction to machine learning**. What Is Machine Learning, Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Supervised and Unsupervised Learning, Reinforcement Learning, Generalization, Over-fitting, and Under-fitting	(6)
2	**Supervised Learning-1:** k-Nearest Neighbors, linear Models, Naive Bayes Classifiers, Decision Trees	(6)
3.	**Supervised Learning-2:** Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers, The Decision Function, predicting Probabilities, Uncertainty in Multiclass Classification, multivariate classification and regression.	(6)
4	**Unsupervised Learning**: *k*-Means Clustering , Expectation-Maximization Algorithm, Supervised Learning after Clustering , Hierarchical Clustering, Choosing the Number of Clusters	(6)
5	**Design and Analysis of Machine Learning Experiments:** Factors, Response, and Strategy of Experimentation, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Bootstrapping, Measuring Classifier Performance, Hypothesis Testing, Assessing a Classification Algorithm's Performance, Comparing Two Classification Algorithms,Basics of feature engineering.	(5)
6	**Advances in Machine Learning**: Combining multiple learners, bagging and boosting, introduction to learning using Neural networks, shallow and deep networks.	(6)

VI Semester
PE-II: IT 2361 - Machine Learning

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Introduction to Machine Learning, Second Edition		Ethem Alpaydın	The MIT Press
2	Introduction to Machine Learning with Python, A Guide for Data Scientists		Andreas C. Müller and Sarah Guido	ORIELLY

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Machine Learning		Tom M. Mitchel	McGraw Hill

VI Semester

IT 2362 - PE-II: Lab - Machine Learning

Course Learning Objective	Course Outcomes
To understand the working of Machine learning, algorithms practically.	Students will be able to: Implement the Machine learning algorithms to solve the given problem

Sr. No..	Problem Statements
1	Experiment on k-Nearest Neighbors, ,
2	Experiment on Naive Bayes Classifiers
3	Experiment on Decision Trees
4	Experiment on Kernelized Support Vector Machines
5	Experiment on *k*-Means Clustering
6	Experiment on Hierarchical Clustering
7	Experiment on K-Fold Cross-Validation
8	Experiment on combining multiple learners
9	Experiment on neural networks using backpropagation algorithm
10	Experiment on deep neural networks

VI Semester
IT 2363 - PE-II: Business Intelligence

Objective	Course Outcome
Student will : 1. Understand the business relevance and technical basics of business intelligence (BI), knowledge management (KM), and decision support and describe how OLAP is different from OLTP. 2. Appreciate the use of SQL for BI 3. Understand principles of dimensional modeling. 4. Understand Business intelligence system architecture, its building blocks, life cycle of a typical BI project. 5. Get acquainted to BI tool	After completion of the course: 1. Students will be able to : ➢ Assemble BI as a Process, identify its application in various domains and functional area, its roles and responsibilities. ➢ Identify functions of building blocks in N_tier BI ecosystem ➢ Identify different stages in Lifecycle of a BI project. ➢ Differentiate between traditional BI and self service BI **(PO1-2)** **2.** Apply SQL as a universal language for BI (**PO23)** **3.** Model a business scenario; identify the metrics, indicators, various dimensions, and aggregation strategies and make recommendations to achieve the business goal (**PO3-3)** **4**. Obtain hands on experience with some popular BI software for analysis, reporting, visualization of results **(PO1-2, PO2-2,PO3-2,PO5-3)**

Unit No.	Contents	Max. Hrs.
1	**Introduction to Business Intelligence** What is business intelligence, why do we need BI, EIS,MIS,DSS& BI, information pyramid-data, information, Knowledge & intelligence. Basis For operational, tactical & strategic decision making , OLTP vs. OLAP, Requirement gathering in BI through business question BI in various domains and functional area.	6.
2	**SQL the universal language for Business Intelligence** Introduction to RDBMS, Language for retrieving data from a database, various clauses in a SQL retrieving data from multiple tables- joins filtering, sorting & grouping datasets, Introduction to DDL & DML statements, various built- in functions in SQL, Use of sub-queries, data dictionary and dynamic SQL.	7

VI Semester
IT 2363 - PE-II: Business Intelligence

3	**Principles of Dimensional modeling** Foundation for fact based decision making, star and snowflake schema, Pros& cons of the star/snowflake schema dimensional model, Slowly changing dimension tables, Fact-less fact strategy, Time dimension.	6
4	**Business Intelligence system architecture** Need for enterprise class business intelligence infrastructure, The BI ecosystem, Building blocks of a n- tier BI system-servers & communication protocols, The central repository-metadata, Information consumption user interfaces-desktop vs. web vs. Mobile. Open architecture, Scalability, performance in BI-in memory analytics.	7
5	**BI Project Lifecycle** Typical BI project lifecycle, Requirements gathering & analysis-functional & non- functional requirements, reports and dashboards design- mock – up and storyboarding, Testing in a BI project, BI project deployment, Post production support, Applications of BI, BI best practices	7
6	**Self-service Analytics** What is Self-service Analytics, What are the use cases of self-service analytics, Business Paradigm vs IT paradigm and the Paradigm Shift with self-service analytics, Challenges of Self-service Analytics, Introduction to MicroStrategy Desktop – Overview	7

VI Semester

IT 2363 - PE-II: Business Intelligence

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Data Warehousing ETL toolkit, Indian edition.		Ralph Kimball and Margy Ross	
2	Fundamentals of Business Analytics2nd edition		R. N. Prasad, Seema Acharya	Wiley.
3	Business Intelligence: The Savvy Manager's Guide,2nd Edition		David Loshin	

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Business intelligence for the enterprise		Mike Biere,	IBM

VI Semester

IT 2364 - PE-II: Lab - Business Intelligence

Course Learning Objective	Course Outcomes
Students will 1. Understand the SQL and details of algorithms made available by popular commercial BI Tools 2. Get acquainted with one BI tool and obtain an hands on experience with some popular BI Tool	After completion of the course: 1. Students will be able to apply SQL as a universal language for BI. 2. Students will able to obtain hands on experience with some popular BI software And demonstrate the ability to use BI tool for analysis, designing schema, reporting, visualization of results

Sr. No	Problem Statements
1	Exploring HR schema of Oracle, Implementation of queries based on range, relational operators, sorting, concatenation.
2	Implementation of queries based on character matching, aggregate functions, set operations
3	Implementation of queries based on Joins (joining 2 or more tables), sub queries.
4	a. Design a multidimensional data cube for given data Using EXCEL b. Perform OLAP- slicing operation on it
5	Creation Of Dashboard Using EXCEL
6	Exploring MICROSTRATEGY ANALYTIC DESKTOP (MSTR) : Installation Of Microstrategy Analytic Desktop And Importing Data from file, Data Wrangling (Editing Data).
7	Visualization Of Data Using different visualizations in MSTR analytic desktop, Filtering data, and delivering Insights from data
8	Create reports and Dashboard with defined insights /requirements in MSTR analytic desktop. (Sample Data to be provided)

VI Semester
IT 2365 - PE-II: Internet of Things

Course Objective	Course Outcome
The student will study 1. The students will be able to describe IoT as a Process, its architecture and Management, compare and contrast old and new challenges in IoT 2. The students will be able to Apply various communication protocol and its building blocks in IoT applications. 3. The students will be able to Illustrate relevance of IoT with cloud and Web and analyze various security challenges and also evaluate various control strategies for the same 4. The students will be able to create, Design and Develop various applications based on IoT concepts	On completion of this course, the student will be able to 1. Students will able to describe various communication protocol and its building blocks. 2. Students will able to describe relevance of IoT with cloud and the application areas of IOT. 3. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor 4. Able to understand building blocks of Internet of Things and characteristics. 5. The students will study and implement IoT project by studying different IoT components, electronic board and their uses.

Unit No.	Contents	Max. Hrs.
1	Introduction to IoT: History of IOT, Concepts, Products and Examples. IOT Paradigm, The Layering concepts of IOT, IOT Communication Model, IOT Architecture, The 6LoWPAN,Domains of IOT, M2M vs IOT, Management of IOT, IOT Platforms, IOT Languages, IOT Physical Systems, Tools for IOT	8 hrs
2	IoT Communication Protocols: Protocol Standardization for IOT, Issues with IOT Standardization, M2M and WSN Protocols, SCADA and RFID Protocols, IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Unified Data Standards.	8 hrs
3	Web of Things: Web of Things versus Internet of Things, The Two Pillars of the Web, Architecture Standardization for Web of Things, Platform Middleware for Web of Things, Unified Multitier Web of Things Architecture, Web of Things Portals and Business Intelligence	7 hrs

VI Semester
IT 2365 - PE-II: Internet of Things

4	Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards, Cloud Providers & Systems, Mobile Cloud Computing, Cloud of Things Architecture. Models of Implementation, Service Level Agreement (SLA), Examples of Applications.	7 hrs
5	Security Aspects: Security in IOT: Introduction, Purpose, Issues, Challenges. IOT Threats to Individual and Organizations, Challenges to Secure IOT Development, Recommended Security Controls. Cybersecurity and IOT. Layered Security Protections to Defend IOT Assets.	7 hrs
6	IoT Applications: IOT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IOT electronic equipment. Use of Big Data and Visualization in IOT. Role of IOT for Increased Autonomy and Agility in Collaborative Production Environments, Resource Management in the IOT.	7 hrs

Text Books

SN	Title	Edition	Authors	Publisher
1	Internet of Things: A Hands-on-Approach		Arshdeep Bahga & Vijay Madisetti	Orient Blackswan Publisher
2	The Internet of Things: Key Applications and Protocols		Olivier Hersent, David Boswarthick & Omar Elloumi	Wiley publication

VI Semester

IT 2366 - PE-II: Lab - Internet of Things

Objective	Course Outcome
Student will study: 1. The students will be able to Illustrate relevance of IoT with cloud and Web and analyze various security challenges and also evaluate various control strategies for the same 2. The students will be able to create, Design and Develop various applications based on IoT concepts	After completion of the course students will be able to: 1. Students will able to describe relevance of IoT with cloud and the application areas of IOT 2. The students will study and implement IoT project by studying different IoT components, electronic board and their uses.

List of Practical's

Sr. No..	Problem Statements
1	Study of Ardunio Kit
2	Study of Raspberry Pi Kit
3	Study of different electronics components
4	Study of different sensors in IoT
5	Case study: Smart Irrigation System using IoT and cloud
6	Case Study: IOT Car Parking System
7	Case Study: IOT Based ICU Patient Monitoring System
8	Case Study: Smart Dustbin With IOT Notifications
9	Project: Designing of Home Automation System
10	Mini Project

VI Semester
IT 2371 - OE-III: Industry 4.0

Objective	Course Outcome
Students will: 1) Able to learn an introduction to Industry 4.0 (or the Industrial Internet) 2) Will able to understand its applications in the business world. 3) Will able to understand Business Model and Reference Architecture in Industry 4) Will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.	After completion of this course: 1) Students will be Understand the basics of IoT and basics of Industry 4.0. 2) Students will be Understand Business Model and Reference Architecture 3) Students will be able to understand the different Business issues in Industry 4.0 and how to solve them. 4) Students will be able to understand the need of Security and Fog Computing and applications of IIoT.

Unit No.	Contents	Max. Hrs.
1	Introduction to IoT: History of IOT, Concepts, Products and Examples. IOT Paradigm, The Layering concepts of IOT, IOT Communication Model, IOT Architecture, IoT Sensing and Actuation, IoT Connectivity, IoT Networking. Introduction to Industry 4.0: History, Concept, The Journey so far: Developments in USA, Europe, China and other countries, The Fourth Revolution, Compelling Forces and Challenges for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory, Globalization and Emerging Issues.	7
2	Basics of Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Life-cycle Management, Augmented Reality and Virtual Reality, Introduction to Artificial Intelligence, Big Data and Advanced Analysis, Cyber-Security in Industry 4.0, Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.	7
3	Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.	6

VI Semester
IT 2371 - OE-III: Industry 4.0

Unit No.	Contents	Max. Hrs.
4	Business issues in Industry 4.0:IIoT case studies, Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world	6
5	Security and Fog Computing: Cloud Computing in IIoT, Fog Computing in IIoT, Security in IIoT. Application Domains: Factories and Assembly Line, Food Industry, Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications),	7
6	Industrial IOT- Application domain: Milk Processing and Packaging Industries, Manufacturing Industries, Virtual Reality Lab, Steel Technology Lab. Facility Management, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries. Facility Management.	7

Text Books

SN	Title	Edition	Authors	Publisher
1	Industry 4.0: The Industrial Internet of Things		Alasdair Gilchrist	Apress
2	Industrial Internet of Things: Cyber manufacturing Systems		Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat	Springer

VI Semester
IT 2372 - OE-III: Core JAVA

Objective	Course Outcome
Student will : 1. Learn the Concepts of Java programming language 2. Learn Java's syntax, idioms, patterns, and styles to write simple JAVA program. 3. To develop object centric thinking and to use object oriented features of JAVA to write complex programs. 4. Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them in application development	After completion of the course students will be able to: 1. Demonstrate the understanding of Object oriented concepts. 2. Apply the programming language JAVA efficiently in object oriented software development 3. Able to analyze problem statement and identify appropriate objects and methods 4. Design and implement a small programs using classes

Unit No.	Contents	Max. Hrs.
1	Introduction to Programming Methodologies, Introduction to Object oriented programming, Objects and Classes, Characteristics of OOP, Encapsulation and data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Structured Versus Object oriented programming, Merits and demerits of object oriented methodology, introduction to Java as OOP language	7
2	Building blocks of java, Data types, Variable declarations, operators and Assignments, control structures, Identifying objects and classes, Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control	7
3	Java as OOP language, Other Class Modifiers: static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances)	6
4	Arrays and Strings: Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes	6
5	Exception handling mechanism: Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses	7
6	I/O Streams: Introduction to stream classes, use of stream classes, I/O stream, bytes stream, character stream, pre-defined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files ,transient and volatile modifiers	7

VI Semester
IT 2372 - OE-III: Core JAVA

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Thinking in Java		Bruce Eckel	Prentice Hall

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Programming with Java		E Balagurusamy	TATA Mc Graw-Hill
2	Java2CompleteReference		Herbert Schildt	Mc Graw-Hill

VI Semester
IT 2381 - OE-IV: Introduction to Machine Learning

Objective	Course Outcome
1. To introduce basic concepts of machine learning and explain the relative strengths and weaknesses of different machine learning Methods. 2. To understand the different aspects of supervised learning 3. To understand the concepts of unsupervised learning 4. To learn to apply supervised and unsupervised learning algorithms to solve the problem	After undergoing the course, student will be able to: 1. Understand various models of supervised and unsupervised learning 2. analyze a problem and identify appropriate learning paradigm to solve it. 3. apply supervised learning for the given set of labeled samples and design the model to meet the desired output 4. apply unsupervised learning for the given set of samples, and design the model to meet the desired output

Unit No.	Contents	Max. Hrs.
1	Introduction to machine learning. What Is Machine Learning, Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Supervised and Unsupervised Learning, Reinforcement Learning, Generalization, Overfitting, and Underfitting	6
2	Supervised Learning-1: k-Nearest Neighbors, linear Models, Naive Bayes Classifiers, Decision Trees	6
3	Supervised Learning-2: Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers, The Decision Function, predicting Probabilities, Uncertainty in Multiclass Classification	6
4	Unsupervised Learning: *k*-Means Clustering , Expectation-Maximization Algorithm, Supervised Learning after Clustering , Hierarchical Clustering, Choosing the Number of Clusters	6
5	Design and Analysis of Machine Learning Experiments: Factors, Response, and Strategy of Experimentation, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.	5
6	Advances in Machine Learning: Introduction to learning using Neural networks, shallow and deep networks.	6

VI Semester

IT 2381 - OE-IV: Introduction to Machine Learning

Text Books				
SN	**Title**	**Edition**	**Authors**	**Publisher**
1	Introduction to Machine Learning, Second Edition		Ethem Alpaydın	The MIT Press
2	Introduction to Machine Learning with Python, A Guide for Data Scientists		Andreas C. Müller and Sarah Guido	ORIELLY

Reference Books				
SN	Title	Edition	Authors	Publisher
1	Machine Learning	Tom M. Mitchel	McGraw Hill	
2				

VI Semester
IT 2382 - OE-4: Information Security

Objective	Course Outcome
Student will able: 1. To focus on the foundations Computer Security and Threats to security 2. To understand basic concepts of Threats and Intruders. 3. To demonstrate and understand the concepts and application of Communication, Server, System , Network, Internet and cyber security and understanding standards. 4. To know the working of Server security, various System and Application Security, IT Act.	After completion of the course: 1. To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security. 2. Students will be able to understand how to protect information and provide authentication using Communication, Server, System, Network, Internet and cyber security 3. Students will able to effectively use of encryption standards and its implementation. 4. Students will be able to understand various technologies and Internet Application with the understanding of IT Act and its protection.

Unit No.	Contents	Max. Hrs.
1	**Introduction**- Computer Security, History of Computer security, Computer Security Concepts (CIA), The OSI security architecture, security attacks, security mechanism, a model for network security, Threats to security, Computer System Security and Access Controls (System access and data access), Key Terms.	7
2	**Malicious software:** Types of Malicious software, Viruses, Virus countermeasures, Worms , Trojan horse, bombs, Trap doors, spoofs, Email virus, Macro viruses, Remedies, Intruders, vulnerabilities & threats, distributed Denial of service attack and Firewalls.	8
3	**Communication security**- Encryption, classical encryption techniques, Block cipher and data encryptions standards, advance encryption standard.Kerberos,X.509	8
4	**Principles of public key cryptosystems:** RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm. Hash Function: Authentication requirements - authentication functions - message authentication code hash functions - birthday attacks	8
5	**Network and Internet Security-** Transport-Level Security-Secure Socket Layer and Transport Layer Security, SSL Architecture. Electronic Mail security-Pretty Good Privacy, S/MIME.	7

VI Semester
IT 2382 - OE-4: Information Security

6	System security and cyber security - Security for network server, web servers, Intrusion detection techniques,intruders,Passwordmanagement,. Cybercrime and Computer Crime Types of Computer Crime, Law Enforcement Challenges, Working With Law Enforcement , Intellectual Property[Types of Intellectual Property, Intellectual Property Relevant to Network and Computer Security], Ethical Issues [Ethics and the IS Professions, Ethical Issues Related to Computers and Information Systems],Security tools, The Information Technology ACT, 2008.	7

Text Books

SN	Title	Edition	Authors	Publisher
1	Cryptography and Network Security		William Stallings	Pearson Education
2	Computer Security: Art and Science		Matt Bishop	Addison Wesley

Reference Books

SN	Title	Edition	Authors	Publisher
1	Introduction to computer Security		Mathew Bishop	Pearson
2	Network Security: Private Communication in a Public World (Prentice Hall Series in Computer Networking and Distributed)		Charlie Kaufman, Radia Perlman, Mike Speciner	Pearson Education
3	Computer Security		Dieter Gollmann	John Wiley & Sons

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Engineering

SoE & Syllabus 2018

7th & 8th Semester

Information Technology

28 June 2019

VII Semester
IT2401 – Data Mining

Objective	Course Outcome
The student should be able to 1. Introduce the data mining fundamentals, different techniques and identify the scope and necessity of Data Mining for the society. 2. Understand the basic concepts of data mining functionalities, its algorithms and applications. 3. Understand the importance of mining web data, ,text data and different approaches for mining. 4. Become familiar with popular data mining tools , able to use it and perform data mining on data sets	**On completion of this course, the student will be able to** **1.** Apply basic concepts in data mining, Identify the scope and necessity of Data Mining for the society and for business applications. **2.** Apply different data mining algorithms on given data set. **3.** Analyze about appropriate data preprocessing tasks, data mining technique applicable for different type of data like web data, text data 4. Use popular data mining tool and apply the principle algorithms and techniques used in data mining, on different types of dataset, analyze their results, interpret the results using different visualization techniques.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Apply basic concepts in data mining, Identify the scope and necessity of Data Mining for the society and for business applications.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply different data mining algorithms on given data set.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Analyze about appropriate data preprocessing tasks, data mining technique	2	3	-	-	-	-	-	-	-	-	-	-	-	-

	applicable for different type of data like web data, text data														
CO4	Use popular data mining tool and apply the principle algorithms and techniques used in data mining, on different types of dataset ,analyze their results, interpret the results using different visualization techniques.	-	**2**	-	-	**3**	-	-	-	-	-	-	-	-	-

Unit No.	Contents	Max. Hrs.
1	Introduction to data mining: Data mining definitions & task, data mining on what kind of data ,Knowledge Discovery vs. Data mining, DBMS vs. Data Mining, Data mining functionalities, data mining task primitives , Major issues in data mining , applications of data mining.	5
2	Association Rule Mining: what is Frequent itemsets, closed itemsets, and association rules, frequent pattern mining, applications of Association Rule mining, The Apriori algorithm for finding frequent itemset using candidate generation, generating association rules from frequent itemsets .Improving effieciency of Apriori , FP- growth algorithm.	6
3	Classification and prediction: What is classification , prediction., Issues regarding Classification and prediction, Decision tree construction principle, Decision tree construction algorithms ID3, C4.5, Classification using decision tree Induction , naive bayes algorithm, KNN algorithm ,prediction using Linear regression.	7
4	**C**luster Analysis : What is cluster analysis, its applications, clustering paradigms, Partioning algorithms: K- means, K-medoids, Hierarchial clustering: Agglomerative and Divisive hierarchical clustering, Density based clustering -DBSCAN	7
5	Web Mining: Introduction, web content mining, web structure mining, web usage mining, mining multimedia data on web, page rank algorithm , web crawlers	6
6	Text mining:Text data analysis and Information retrieval, Unstructured texts, text mining approaches, text preprocessing ,episode rule discovery for texts, Hierarchy of categories, text clustering. Introduction to NLP	6

Text Books			
SN	**Title**	**Authors**	**Publisher**
1	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber and Jian Pei	Morgan Kaufmann Publishers

Reference Books			
SN	Title	Authors	Publisher
1	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Vipin Kumar,	Pearson Addison Wesley,
2	Discovering Knowledge in Data: An Introduction to Data Mining	Daniel T. Larose	Wiley
3	Data mining with R	Chapman and Hall	CRC press

VII Semester
IT2402- Data Mining Lab

Objective	Course Outcome
The student should be able to Become familiar with popular data mining tools , able to use it and perform data mining on data sets	**On completion of this course, the student will be able to** Use popular data mining tool and apply the principle algorithms and techniques used in data mining, on different types of dataset , analyze their results, interpret the results using different visualization techniques.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	Use popular data mining tool and apply the principle algorithms and techniques used in data mining, on different types of dataset ,analyze their results, interpret the results using different visualization techniques.	-	2	-		3	-	-	-	-	-	-	-	-	-

List of Practical's

Sr. No.	Problem Statements
1	Introduction to R - fundamentals and basic data types, import / export data and **Preprocessing** on data set using R
2	Implementation of association rule mining in R
3	Implementation of Data Classification using Bayes classification **in R**
4	Implementation of Data Classification using decison tree **in R**
5	Implementation of Data Clustering using K-means in **R**
6	Implementation to PREDICT DATA using linear regression methods.
7	Mining text data using R
8	Data exploration and visualization
9	Develop one Application (eg sentiment analysis)

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Information Technology

VII Semester

IT2403 – Principles of Artificial Intelligence

Objective	Course Outcome
The student should be able to 1. Familiarity with AI and fundamental problem solving using AI 2. Understand the strengths and limitations of Various state-space search algorithms, and choose the appropriate algorithm for a problem. 3. Ability to implement and evaluate intelligent agents for representative AI problems – e.g., constraint satisfaction, automated theorem proving, etc. 4. Represent domain knowledge in propositional and first-order logic and in various knowledge represent 5. Ability to design intelligent agents for problem solving, reasoning, planning, and decision making. 6. Understand probabilistic reasoning techniques and use them to solve problems with noise, incomplete information, and uncertainty.	**On completion of this course, the student will be able to** 1. Students will able to understand basics of AI, apply and choose proper state space search algorithm for the given problem (1 & 2) 2. Students will able to make intelligent choices from among available algorithms and knowledge representation schemes subject to specific design and performance constraints. (3 & 4) 3. Students will able to solve problems with appropriate algorithms, perform its implementation and their experimental evaluation for incomplete and/or uncertain information (5 & 6)

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	Students will able to understand basics of AI, apply and choose proper state space search algorithm for the given problem	3	3	3	3	2									2
CO2	Students will able to make intelligent choices from among available algorithms and knowledge representation schemes subject to specific design and performance constraints.	3	3	3	3	2									2
CO3	Students will able to solve problems with appropriate algorithms, perform its implementation and their experimental evaluation for incomplete and/or uncertain information	3	3	3	3	2	3								2

Unit No.	Contents	Max. Hrs.
1	Introduction: -: What is AI?, History, Overview, Intelligent Agents, Performance Measure, Rationality, structure of agents, problem solving agents, Problem Formulation, searching for solutions – uniformed search	[08 Hrs.]
2	Informed (Heuristic) Search and Exploration, Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Local Search algorithms, Hill-climbing, Simulated Annealing, Genetic Algorithms, Online search	[09 Hrs.]
3	Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance	[09 Hrs.]
4	Knowledge Based Agents: Logic, Propositional Logic, Inference, Equivalence, Validity and Satisfiability, Resolution, Forward and Backward Chaining, Local search algorithms, First Order Logic, Models for first order logic, Symbols and Interpretations, Terms, Atomic sentences, complex sentences, Quantifiers, Inference in FOL, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.	[08 Hrs.]
5	Planning, Language of planning problems, planning with state-space search, forward and backward state-space search, Heuristics for state-space search, partial order planning, planning graphs, planning with propositional logic	[07 Hrs.]
6	Uncertainty, Handing uncertain knowledge, rational decisions, basics of probability, axioms of probability, inference using full joint distributions, independence, Baye's Rule and conditional independence, Bayesian networks, Semantics of Bayesian networks, Exact and Approximate inference in Bayesian Networks. Introduction to machine learning, Responsible AI, Explainable AI, Case studies of AI	[08 Hrs.]

Text Books

SN	Title	Authors	Publisher
1	Artificial Intelligence a Modern Approach	Russel and Norvig	Pearson Education
2	Introduction to Artificial Intelligence & Expert System	D.W Patterson	PHI

Reference Books

SN	Title	Authors	Publisher
1	Artificial Intelligence	E.Rich and K.Knight	McGraw-Hill
2	Principles of Artificial Intelligence	N.J Nilsson	Narosa
3	Artificial Intelligence	George F. Lugar	Pearson Education, 4th edition

VII Semester
IT2411 : PE-III - Cloud Computing

Course Learning Objective	Course Outcomes
1. To study the different Computing Systems with the comprehensive and in-depth knowledge of Cloud Computing. 2. To study the basics of Cloud Computing Concepts and Technology 3. To study the Cloud Computing architecture and its applications, Fundamental issues and Technologies. 4. To Study of Cloud application design considerations and its methodology 5. To Study basics of Cloud Computing Security mechanisms. 6. To Study applications of Hadoop and MapReduce in Cloud Computing	After After completion of the Course Students will be able to CO1: Understand the different computing paradigm, analyze and apply cloud computing services, deployment model for building cloud CO2: Apply the concepts and techniques in cloud computing CO3: Analyze the problems and apply design considerations for cloud application CO4: Provide the appropriate cloud computing solutions for building cloud application

CO	State ment	Mapped PO									PO1	PO1	PO1	PSO	PSO
		PO	PO	PO	PO	PO	PO	PO	PO	PO					
CO1															
CO2															
CO3															

Unit No.	Contents	Max. Hrs.
1	Overview of Computing Paradigm, Recent trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing, Evolution of cloud computing, Business driver for adopting cloud computing, Introduction to Cloud Computing, Cloud Computing (NIST Model), History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages of Cloud Computing, Benefits of Cloud Computing, Role of Open Standards.	[07 Hrs.]
2	Cloud Computing Architecture, Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS). Deployment Models, Public cloud Private cloud, Hybrid cloud, Community cloud	[08 Hrs.]

3	Virtualization Technology: Fundamental concepts of compute, storage, networking, desktop and Application virtualization. Types of Virtualization, Virtualization benefits, server virtualization, Block and file level storage virtualization, Hypervisors, Hypervisor management software, Infrastructure Requirements, Virtual LAN (VLAN) and Virtual SAN (VSAN) and their benefits.	[07 Hrs.]
4	Service Management in Cloud Computing, Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing	[07 Hrs.]
5	Cloud Security, Infrastructure Security: Network level security, Host level security, Application level security, Data security and Storage: Data privacy and security Issues, Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations	[07 Hrs.]
6	Case Study on Open Source & Commercial Clouds: Google App Engine, Microsoft Azure, Amazon EC2	[06 Hrs.]

Text Books

SN	Title	Authors	Publisher
1	Cloud Computing Bible	Barrie Sosinsky,	Wiley-India, 2010
2	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski	WileY, 2011

Reference Books

SN	Title	Authors	Publisher
1	Cloud Computing: Principles, Systems and Applications,	Nikos Antonopoulos, Lee Gillam,	Springer, 2012
2	Cloud Security: A Comprehensive Guide to Secure Cloud Computing	Ronald L. Krutz, Russell Dean Vines	Wiley-India, 2010
3	"Cloud Computing"	Kumar Saurabh	Wiley Pub

VII Semester
IT2412 :PE-III - Real Time Systems

Objective	Course Outcome
The student should be able to 1) To understand the Real-time scheduling and schedulability analysis 2) To study and understand the concepts of priority driven scheduling and schedulability test. 3) To study and understand the concepts of execution of periodic, sporadic, and aperiodic jobs. 4) To understand Design methods for real-time systems , Formal specification and verification of timing constraints and properties	**On completion of this course, the student will be able to** 1) Understand the basics and importance of real-time systems and explain & address the fundamental problems of real-time systems; 2) Compare different scheduling algorithms and the schedulability criteria and Determine schedulability of a set of periodic tasks given a scheduling algorithm. 3) Develop algorithms to decide the admission criterion of sporadic jobs and the schedule of aperiodic jobs. 4) Integrate resource access mechanisms with the scheduling techniques and develop integrated schedulaibility criteria.

CO	Statement	Mapped PO												PSO	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Understand the basics and importance of real-time systems and explain & address the fundamental problems of real-time systems	3.	2.												
CO2	Compare different scheduling algorithms and the schedulability criteria and Determine schedulability of a set of periodic tasks given a scheduling algorithm.		2.	2.											
CO3	Develop algorithms to decide the admission criterion of sporadic jobs and the schedule of aperiodic jobs.		3.	2.											
CO4	Integrate resource access mechanisms with the scheduling techniques and develop integrated schedulibility criteria		3.	3.											

Unit	Contents	Max.
1	**Introduction to real time systems:** The Concepts of Real-Time Systems, real time applications according to timing attributes. Hard and soft real time system: The Concept of Real-Time Tasks, Jobs & processors, release times, deadlines, timing constraint, Hard & Soft timing constraint, Hard real time systems, soft real time systems. Modeling of real time systems: Processors and Resources, Temporal Parameters of Real Time Work load, Periodic task Model, Precedence Constraints and Data Dependency. **Approach to real time scheduling:** Clock-driven approach, weighted round-robin approach, priority-driven approach, dynamic versus static systems, effective release times and deadlines, optimality of EDF & LST algorithms, Non-optimality of the EDF & LST, challenges in validating timing constraints in priority-driven systems, off line versus on-line scheduling.	6
2	**Clock driven scheduling:** Notations & assumptions, static timer-driven scheduler, general structure of cyclic schedules, cyclic executives, improving the average response time of a periodic jobs, scheduling sporadic jobs, practical consideration and generalizations, algorithms for constructing static schedules, pros-cons of clock-driven scheduling.	7
3	**Priority-driven scheduling:** Static assumptions, fixed-priority versus dynamics priority algorithms, Rate-Monotonic and Deadline-Monotonic Algorithms , maximum schedulable utilization of EDF Algorithm, optimality of the RM & DM algorithms	6
4	**Priority-driven scheduling:** A schedulability test for fixed priority tasks with short response times & with arbitrary response times, Critical Instants, Time Demand Analysis, sufficient schedulability conditions for the RM & DM algorithms.	7
5	**Scheduling aperiodic & sporadic jobs in priority-driven systems:** Assumptions & approaches, deferrable servers, sporadic servers, constant utilization, total bandwidth and weighted fair-queuing servers, slack stealing in dead-line driven systems, slack stealing in fixed-priority systems, scheduling of sporadic jobs.	8
6	**Resources and resource access control:** Assumption on resources and their usage, effects of resource contention & resource access control, non-preemptive critical sections, basic priority-inheritance protocol, basic priority-ceiling protocol, stack-based priority –ceiling protocol, use of priority-ceiling protocol in dynamic-priority systems, preemption-ceiling protocol, controlling accesses to multiple-unit resources, controlling concurrent accesses to data object.	8

Text Books			
Sr. N.	Title	Authors	Publisher
1	Real Time Systems	Jane W. S. Liu	Pearson education
Reference Books			
1	Real Time Systems	C.M. Krishna & Kang G. Shin	McGraw Pub.

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Information Technology

VII Semester

IT2413 :PE-III – Network Security

Objective	Course Outcome
The student should be able to 1) Understand basics of Cryptography and Network Security. 2) Secure a message over insecure channel by various means. 3) Learn about how to maintain the Confidentiality, Integrity and Availability of a data. 4) Understand various protocols for network security to protect against the threats in the networks.	**On completion of this course, the student will be able to** 1) Understand how to provide security of the data over the network. 2) Do research in the emerging areas of cryptography and network security 3) Understand how to Implement various networking protocols 4) Understand how to protect any network from the various threats in the world.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Understand how to provide security of the data over the network.	3													
CO2	Do research in the emerging areas of cryptography and network security	3	2	2											
CO3	Understand how to Implement various networking protocols	3	2	2											
CO4	Understand how to protect any network from the various threats in the world.	3	2												

Unit No.	Contents	Max. Hrs.
1	Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography	6
2	Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - fiestal structure , data encryption standard(DES) , strength of DES , differential and linear crypt analysis of DES , block cipher modes of operations , triple DES	6
3	Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring ,Groups ,field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing ,Galois field,AES	6
4	Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Message Authentication .Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks	6
5	Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME	6
6	IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management. Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals – trusted systems.	6

Text Books

SN	Title	Authors	Publisher
1	Cryptography and Network security Principles and Practices	William Stallings	Pearson/PHI.
2	Cryptography & Network Security	Behrouz A. Forouzan	McGraw-Hill

Reference Books

SN	Title	Authors	Publisher
1	Introduction to Cryptography with coding theory	Wade Trappe, Lawrence C Washington	Pearson
2	Modern Cryptography	W. Mao	Pearson Education

VII Semester
IT2414 - PE III: Information Retrieval

Objective	Course Outcome
1. To provide an overview of Information Retrieval. 2. To introduce students about insights of the several topics of Information retrieval such as – Boolean retrieval model, Vector space model, Latent semantic indexing, XML and Image retrieval model. 3. To provide comprehensive details about various evaluation methods.	**On completion of this course, the student will be able to** 1. Understand different Information retrieval models. 2. Know about evaluation methods of the information retrieval model. 3. Know the challenges associated with each topic

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO0	P11	PO 12	PSO 1	PSO 2
CO1	Understand different Information retrieval models.	**3**	**3**	**2**										**2**	
CO2	know about evaluation methods of the information retrieval model.	**3**	**3**	**3**										**2**	
CO3	know the challenges associated with each topic	**2**	**2**	**2**										**1**	

Unit No.	Contents	Max. Hrs.
1	**Introduction to Information retrieval**: Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model **Dictionary and Postings:** Tokenization, Stop words, Stemming, Inverted, index, Skip pointers, Phrase queries	6
2	**Tolerant Retrieval** :Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex **Term Weighting and Vector Space Model:** Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex	6
3	**Evaluation**: Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems **Latent Semantic Indexing**: Eigen vectors, Singular value decomposition, Low rank approximation, Problems with Lexical Semantics	6

4	**Query Expansion** :Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift	6
5	**Probabilistic Information Retrieval** :Probabilistic relevance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval	6
6	**XML Indexing and Search** :Data vs. Text-centric XML, Text-Centric XML retrieval, Structural terms **Web Information Retrieval:** Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS	5

Text Books

SN	Title	Authors	Publisher
1	Introduction to Information Retrieval	Christopher D. Manning, Raghavan and Schutze,	Cambridge University Press,2008

Reference Books

SN	Title	Authors	Publisher
1	Natural Language Processing And Information Retrieval	Tanveer Siddiqui and U. S. Tiwary	Oxford Higher Education,2008

VII Semester
IT2421 - PE IV: Neural Network and Fuzzy Logic

Objective	Course Outcome
The student should be able to 1. To familiarize with neural networks and learning methods for neural networks 2. To demonstrate neural network applications on real-world tasks 3. To introduce the ideas of fuzzy sets, fuzzy logic and to emphasize the need for fuzzy logic to model linguistic knowledge in human experts 4. To know fuzzy Arithmetic and inference techniques along with its applications 5. To understand fuzzy inference and reasoning to build systems based on fuzzy control and to understand of Neuro-Fuzzy Systems	**On completion of this course, the student will be able to** 1. To understand the working of Neural Networks as pattern classifier 2. Comprehend the Neural Networks as means for computational learning and to analyze the basic network architectures and algorithms 3. Effectively use existing software tools to solve real problems using a neural network approach 4. Apply the basics of fuzzy sets, its operations, fuzzy logic and fuzzy relation to model linguistic knowledge in human experts and to build systems based on fuzzy control and to understand the basics of fuzzy inference and reasoning

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C	To understand the working of Neural Networks as pattern classifier		3												
C	Comprehend the Neural Networks as means for computational learning and to analyze the basic network architectures and algorithms	2		3		3							3	2	
C	Effectively use existing software tools to solve real problems using a neural network approach	3		3		2							3		

C	Apply the basics of fuzzy sets, its operations, fuzzy logic and fuzzy relation to model linguistic knowledge in human experts and To build systems based on fuzzy control and to understand the basics of fuzzy inference and reasoning	3													
	IT2421	3	3	3		2.5							3	2	

Unit No.	Contents	Max. Hrs.
1	Neural Networks: History, overview of biological neuro-system, mathematical models of neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, Learning Tasks, Applications of Artificial Neural Networks	8
2	Feed forward and feedback networks, Single-layer perceptron classifiers, Discriminant functions, linear machine and minimum distance classification, training and classification using the discrete perception - ANN training Algorithms-Single layer perceptron, multi-layer perceptron, RDPTA algorithm	7
3	Multilayer feed forward networks, linearly non-separable pattern classification, delta learning rule, Feed forward recall and error back-propagation training, Hopfield learning algorithm, Self-organizing Map, Introduction to Deep Learning	8
4	Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.	7
5	Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Application of Fuzzy Logic: Medicine, Economics etc.	6
6	Fuzzy control, Fuzzy Inference Engines, Graphical Techniques of Inference, Fuzzyifications/ DeFuzzification, Fuzzy System Design and its Elements, Design options.	6

Text Books

SN	Title	Authors	Publisher
1	Introduction to the theory of Neural Computation	John Hertz, Anders Krogh, Richard Palmer	Addison Wesley
2	Fuzzy Logic with Engineering Applications	Timothy Ross	McGraw-Hill

Reference Books			
SN	**Title**	**Authors**	**Publisher**
1	Neuro-Fuzzy and Soft Computing: A computational Approach to Learning & Machine Intelligence	Roger Jang, Tsai Sun, EijiMizutani,.	PHI
2	Fuzzy sets and Fuzzy logic, Theory and Applications	George J. Klir and Bo Yuan	Prentice Hall
3	Soft Computing and Its Applications	R.A. Aliev, R.R. Aliev	World Scientific
4	Elements of Artificial Neural Networks	Kishan Mehrotra, C. K. Mohan, S. Ranka	Penram International Publishing (India)
5	Neural Networks and Fuzzy Systems	Bar Kosko	Prentice-Hall
6	Artificial Neural Network	B. Yegnanarayana	PHI
7	Neural Networks: A Comprehensive Foundation	Simon Haykin	PHI

VII Semester
IT2422- PE IV: Lab.: Neural Network and Fuzzy Logic

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1. To familiarize with neural networks and learning methods for neural networks 2. To demonstrate neural network applications on real-world tasks 3. To introduce the ideas of fuzzy sets, fuzzy logic and to emphasize the need for fuzzy logic to model linguistic knowledge in human experts 4. To know fuzzy Arithmetic and inference techniques along with its applications 5. To understand fuzzy inference and reasoning to build systems based on fuzzy control and to understand of Neuro-Fuzzy Systems	1. To understand the working of Neural Networks as pattern classifier **2.** Comprehend the Neural Networks as means for computational learning and to analyze the basic network architectures and algorithms **3.** Effectively use existing software tools to solve real problems using a neural network approach 4. Apply the basics of fuzzy sets, its operations, fuzzy logic and fuzzy relation to model linguistic knowledge in human experts and to build systems based on fuzzy control and to understand the basics of fuzzy inference and reasoning

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	To understand the working of Neural Networks as pattern classifier		3												
CO2	Comprehend the Neural Networks as means for computational learning and to analyze the basic network architectures and algorithms	2		3		3							3	2	
CO3	Effectively use existing software tools to solve real problems using a neural network approach	3		3		2							3		

CO4	Apply the basics of fuzzy sets, its operations, fuzzy logic and fuzzy relation to model linguistic knowledge in human experts and To build systems based on fuzzy control and to understand the basics of fuzzy inference and reasoning	3													
		3	3	3		2.5							3	2	

List of Practical's

Sr. No..	Problem Statements
1	Design and Implement n-input NAND and NOR gates using Mc-Culloch Pits Model of a neuron
2	Implement A-Z character recognition using Feedforward Neural Network.
3	Implement clustering algorithm.
4	Design and Implement a linear classifier using SDPTA algorithm for a 3 input logical NAND Problem
5	Implement Back Propagation training algorithm, for any non-linear complex problem
6	Implement SOM algorithm, for any clustering problem
7	Development of fuzzy membership functions and fuzzy set properties
8	Development and verification of logic for fuzzy relations
9	Design of a fuzzy controller for the following system using fuzzy tool of Matlab
10	Application development using NN/Fuzzy logic

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Information Technology

VII Semester

IT1423 – PE IV: Ethical Hacking and Cyber Forensics

Objective	Course Outcome
The student should be able to 1) To learn foundations of Cyber Security and Ethical Hacking analysis using programming languages like python. 2) To learn various types of algorithms and its applications of Cyber Security and Ethical Hacking using forensic detection 3) To learn python toolkit for required for programming Cyber Security, Ethical Hacking concepts. 4) To understand the concepts of Cyber Security, Ethical Hacking Forensic detection image processing ,pattern recognition, and natural language processing	**On completion of this course, the student will be able to** 1) Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information. 2) Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios 3) Identify common trade-offs and compromises that are made in the design and development process of Information Systems 4) Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information	3	3	3	3									3	
CO2	Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios	3	3	3										3	
CO3	Identify common trade-offs and compromises that are made in the design and development process of Information Systems													3	
CO4	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection	3	3	3	3									3	

Unit No.	Contents	Max. Hrs.
1	Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL in jection attacks – Buffer overflow attacks - Privacy attacks.	**07**
2	TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming	**07**
3	Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.	**06**
4	Understanding the Cyberspace Environment and Design Cyberspace environment and its characteristics, Developing a design approach, Planning for cyberspace operation Cyberspace Operational Approaches	**07**
5	Foundational approaches that utilize cyberspace Capabilities to support organizational missions, The pros and cons of the different approaches.	**07**
6	Cyberspace Operations Network Operations (NETOPS), Defensive Cyberspace Operations (DCO), Offensive Cyberspace Operations (OCO), Defense and Diversity of Depth network design, Operation al methodologies to conduct cyberspace operations	**06**

Text Books			
SN	**Title**	**Authors**	**Publisher**
1	Introduction of Cyber Warfare: A Multidisciplinary Approach	Paulo Shakarian	Elsevier 2013.
2	Inside Cyber Warfare: Mapping the Cyber Underworld	Jeffery carr	O'Reilly Publication December 2012
3	Cyber Warfare: Techniques, Tactics and Tools for Security Practitioners	Jason Andress	Syngress, Elsevier 2013.
4	Insider Computer Fraud	Kenneth C.Brancik	Publications Taylor & Francis Group 2008.
5	Ethical Hacking	Ankit Fadia	second edition Ma cmillan India Ltd, 2006

Reference Books			
SN	Title	Authors	Publisher
1	Cryptography, Network Security and Cyber Laws	Bernard Menezes, Cengage Learning	Oxford university press

VII Semester
IT2424 – PE IV: Lab: Ethical Hacking and Cyber Forensics

List of Practical's

Sr. No.	Problem Statements
1	TCP scanning using NMAP Tool
2	Port scanning using NMAP Tool
3	TCP / UDP connectivity using Netcat (networking utility)
4	Network vulnerability using OpenVAS
5	Web application testing using DVWA (Damn Vulnerable Web App (DVWA))
6	Manual SQL injection using DVWA(Damn Vulnerable Web App (DVWA))
7	XSS using DVWA (Damn Vulnerable Web App (DVWA))
8	Automated SQL injection with SqlMap

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Information Technology

VII Semester

IT2425 – PE IV: Human Computer Interaction

Objective	Course Outcome
The student should be able to 1. To study and understand interface design tools, and demonstrate the Interaction between the human and computer components 2. To study and understand the screen designing and its various concepts with design rules 3. To study and understand software tools related to HCI process. 4. To understand the interaction devices.	**On completion of this course, the student will be able to** 1. Apply the knowledge of human components for interaction with computer 2. To understand basics of Computer components functions regarding interaction with human. 3. Demonstrate Understanding of Interaction between the human and computer Components using screen designing concept. 4. To Produce Implementation supports for HCI by using various tools.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Apply the knowledge of human components for interaction with computer	3	3											3	
CO2	To understand basics of Computer components functions regarding interaction with human.	3	3											3	
CO3	Demonstrate Understanding of Interaction between the human and computer Components using screen designing concept.	3	3			3								3	
CO4	To Produce Implementation supports for HCI by using various tools.	3	3			3								3	

Unit No.	Contents	Max. Hrs.
1	Introduction: The human: Human memory, Thinking reasoning and problem solving, Individual differences, Psychology and the design of interactive systems ,Interaction and paradigms: Models of interaction, Frame work and HCI, Ergonomics, Interaction styles, Elements of the WIMP(windows, icons, pointers, menus) interface, interactivity, The context of the interaction, paradigms for interaction	**6**
2	Interaction Design: What is interaction design, Good and poor design, The process of design, User focus, Scenarios, Navigation design, Understanding the problem space, Conceptualizing the design space, Theories, models and frameworks, Screen design and layout, Interaction and prototyping	**5**
3	HCI in software process and Design rules: The software life cycle, Usability engineering, Iterative design and prototyping, Design rationale, Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns	**5**
4	Implementation supports and Evaluation techniques: Elements of windowing system, Programming application, Using toolkits, User interface management systems, What is evaluation? Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing evaluation methods, analytical evaluation	**5**
5	Universal Design and User Support: Universal design principles, Multi-modal interaction, Design for diversity, Requirements of user support, Approach to user support, Adaptive help systems, Design user support systems	**6**
6	Cognitive Models and Distributed Cognition: Goal and task hierarchies, Linguistics models, The challenge of display-based system, Physical and device models, Cognitive architectures, Scientific Foundation, Description, Case Study	**6**

Text Books

SN	Title	Authors	Publisher
1	Human - Computer Interaction	Alan Dix, Janet Fincay, Gregory D. Abowd and Russell Bealg,	Pearson Education, 2003.
2.	Designing the user interface	Ben Shneiderman	Pearson Education Asia, 2004

Reference Books

SN	Title	Authors	Publisher
1	Interaction Design	Preece and Rogers, Sharp	Wiley-India, 2008.
2	The essential guide to user interface design	Wilbert O Galitz	Wiley DreamTech, 2009
3	User Interface Design	Soren Lauesen	Pearson Education, 2005.

VII Semester

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Information Technology

IT2426 – PE IV: Lab- Human Computer Interaction

Objective	Course Outcome
The student should be able to 1. To study and understand interface design tools, and demonstrate the Interaction between the human and computer components 2. To study and understand the screen designing and its various concepts with design rules 3. To study and understand software tools related to HCI process. 4. To understand the interaction devices.	**On completion of this course, the student will be able to** 1) Apply the knowledge of human components for interaction with computer 2) To understand basics of Computer components functions regarding interaction with human. 3) Demonstrate Understanding of Interaction between the human and computer Components using screen designing concept. 4) To Produce Implementation supports for HCI by using various tools.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Apply the knowledge of human components for interaction with computer	3	3											3	
CO2	To understand basics of Computer components functions regarding interaction with human.	3	3											3	
CO3	Demonstrate Understanding of Interaction between the human and computer Components using screen designing concept.	3	3			3								3	
CO4	To Produce Implementation supports for HCI by using various tools.	3	3			3								3	

List of Practical's

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Information Technology

Sr. No.	Problem Statements
1	Study base on Exploration of Human-Computer Interaction (HCI) Applications in 1. Hospitality Industry. 2. e-Shopping System 3. e-Panchayat (e-Government Services) System 4. e-Hotel Reservation System 5. e-Banking System 6. Software Download System ,etc
2	Practical demonstration/implementation based on-Design analysis
3	Practical demonstration/implementation based on-Copy work
4	Practical demonstration/implementation based on-Fonts database
5	Practical demonstration/implementation based on-Style tiles
6	Personal project mockups-phase 1
7	Personal project mockups-phase 2
8	Personal project mockups-phase 3

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Information Technology

VII Semester

IT2427 – PE-IV- Parallel Computing

Objective	Course Outcome
1. To study different parallel processing architectures based on relationships between processing elements, instruction sequence, memory and interconnected networks. 2. To study and understand the concepts of dependence analysis. 3. To study and Understand, the concepts of shared and distributed memory programming using OpenMP and MPI. 4. Study and understand the concepts of GPU computing and heterogeneous parallel programming environments.	After completion of course students will be able to- 1. **Compare & Compute** speedup, efficiency, and scaled speedup of parallel computations. 2. **Analyze and resolve** the dependences in single, double and multi-level loops. 3. **Design and develop** parallel algorithms suited for Shared and Distributed memory models using Open-MP & MPI. 4. **Write** code using accelerator technologies of GPGPUs with CUDA for heterogeneous parallel programming environments.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	**Compare & Compute** speedup, efficiency, and scaled speedup of parallel computations.	3	2												
CO2	**Analyze and resolve** the dependences in single, double and multi-level loops.	3	3												
CO3	**Design and develop** parallel algorithms suited for Shared and Distributed memory models using Open-MP & MPI.	3	2	3											2
CO4	**Write** code using accelerator technologies of GPGPUs with CUDA for heterogeneous parallel programming environments.	3	3			3									2

Unit No.	Contents	Max. Hrs.
1	**Introduction to parallel computing**: Need of ever increasing performance, building parallel systems, need to write parallel programs, Parallel hardware, Parallel Software, Coordinating the processes/threads, Shared-memory, Distributed-memory, Programming hybrid systems. **Parallel Programming Platforms:** Implicit parallelism, Limitation of Memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, communication cost in parallel machines.	7
2	**Principles of Parallel Algorithm Design:** Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing. Methods for Containing Interaction Overheads Parallel Algorithm Models.	7
3	**Dependence Concepts*:*** Basic introduction of dependence in single loop and double loop, Loop-carried and Loop-independent dependences, Techniques for extraction of parallelism, index and iteration spaces and perfect loop nest, test for dependences, GCD test, Bound test.	7
4	**Shared-Memory Programming with OpenMP:** What is OpenMP, creating team of threads, OpenMP Memory model, thread synchronization, Directives, Sharing the Work among Threads in an OpenMP Program : Loop Construct, The Sections Construct , The Single Construct , Workshare Construct, Combined Parallel Work-Sharing Constructs ,Clauses to Control Parallel and Work-Sharing Constructs, OpenMP Synchronization Constructs ,Interaction with the Execution Environment, OpenMP Clauses : If Clause , Num threads Clause, Ordered Clause, Reduction Clause, Copyin Clause ,Copyprivate Clause ,Advanced OpenMP Constructs: Nested Parallelism , Flush Directive , Thread private Directive.	9
5	**Distributed-Memory Programming with MPI :** Compilation and execution, MPI programs ,MPI_Init and MPI_Finalize, Communicators: MPI_Comm_ size and MPI_ Comm_rank, MPI_Send ,MPI_Recv, Message matching, Semantics of MPI_Send and MPI_Recv, Dealing with I/O, Collective communication, MPI derived data types.	8
6	**Compute Unified Device Architecture (CUDA):** CUDA Architecture, Introduction to CUDA C, Kernel Call, Passing parameters, Querying Devices, Thread Cooperation: Splitting blocks, Shared Memory and Synchronization.	7

Text Books			
SN	**Title**	**Authors**	**Publisher**
1	Introduction to Parallel Computing	Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar,	Pearson Edn.
2	Dependence Concept	Utpal Banerjee	Intel Corp.
3	CUDA by Example: An Introduction to General-Purpose GPU Programming	Jason Sanders, Edward Kandrot	Addison-Wesley

Reference Books			
SN	**Title**	**Authors**	**Publisher**
1	Using OpenMP	Barbara Chapman, Gabriele Jost, Ruud van der Pas	MIT Press
2	An Introduction to Parallel Programming	Peter S. Pacheco , Morgan Kaufmann	MORGAN KAUFMANN ELSEVIER

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Information Technology

VII Semester

IT 2428- PE-IV- Lab : Parallel Computing

Objective	Course Outcome
1.To study and Understand, the concepts of shared and distributed memory programming using OpenMP and MPI. 2.Study and understand the concepts of GPU computing and heterogeneous parallel programming environments	1. **Design and develop** parallel algorithms suited for Shared and Distributed memory models using Open-MP & MPI. 2. **Write** code using accelerator technologies of GPGPUs with CUDA for heterogeneous parallel programming environments

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	**Design and develop** parallel algorithms suited for Shared and Distributed memory models using Open-MP & MPI.	**3**	**2**	**3**											**2**
2	**Write** code using accelerator technologies of GPGPUs with CUDA for heterogeneous parallel programming environments.	**3**	**3**			**3**									**2**

List of Practical's

Sr. No.	Problem Statements
1	Open-MP program based on Loop Constructs
2	Open-MP program based on Work Sharing Constructs (shared & Private clause)
3	Open-MP program based on Synchronization Constructs
4	Open-MP program based on Nested Parallelism
5	MPI Program based on basic MPI calls to exchange the data
6	MPI Program based on collective MPI calls
7	CUDA program based on threads and kernel
8	CUDA program based on shared memory synchronization & thread cooperation
9	CUDA program based on Constant Memory & Texture Memory
10	CUDA program based on Nested parallelism

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Information Technology

IT 2431- PE-V- Digital Image Processing

Objectives	Course Outcome
1. To introduce basic concept of Image processing in the spatial and frequency domain 2. To introduce basics of image representation and description. 3. To introduce the basics of color image processing, image segmentation and morphological operations on images 4. To learn various algorithms for image processing	**On completion of this course, the student will be able to** 1. Understand basic concepts of image processing, in the spatial and frequency domain 2. understand basics of image representation and description. 3. comprehend the basics of color image processing, image segmentation and morphological operations on images 4. understand various algorithms for image processing and apply them on given image data

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Understand basic concepts of image processing, in the spatial and frequency domain	3	2	3										1	
CO2	understand basics of image representation and description.	3	2	2										1	
CO3	comprehend the basics of color image processing, image segmentation and morphological operations on images	3	2											2	
CO4	understand various algorithms for image processing and apply them on given image data	3	2	2										2	

Unit	Contents	Hrs.
1	**Introduction**: Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception. Fundamentals of Image processing: A Simple Image Model, Sampling and Quantization, Basic Image operations: Subtraction, Averaging, multiplication, etc., Basic Relationships between Pixels	6
2	**Image Enhancement in the Spatial Domain**: Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Histogram Processing, Local Enhancement, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.	7
3	**Image Enhancement in the Frequency Domain:** Introduction to the Fourier Transform, Discrete Fourier Transformation, Properties of DFT, Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering	7
4	**Image Segmentation**: Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Hough transform, Thresholding Region-oriented Segmentation.	7
5	**Image Representation and description**: Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region, Description: Boundary Descriptors, Shape Numbers, Fourier Descriptors, Regional Descriptors, Simple Descriptors, Topological Descriptors	6
6	**Basics of morphological Image Processing**, **Introduction to colour image processing**: colour models, pseudo colour image processing, introduction to image file formats: TIFF, JPEG, BMP, etc.	6

Notes: Assignments in TA should be based on Programming on Image Processing concepts learned.

Text Books			
SN	**Title**	**Authors**	**Publisher**
1	Digital Image Processing	Rafael C. Gonzalez and Richard E. Woods	Prentice Hall, 2007

Reference Books			
SN	**Title**	**Authors**	**Publisher**
1	Image Processing Principles & Applications	Tinku Acharya & Ajoy K. Ray	Willey Inter-Science, 2005

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Information Technology

VII Semester

IT2432 – PE-V: Distributed Systems

Objective	Course Outcome
The student should be able to 1) To study basic techniques in the design and development of Distributed Systems 2) To understand the concepts of Interprocess communication and Remote Procedure Calls. 3) Understanding solutions of the fundamental problems in distributed systems like mutual exclusion, deadlock detection, termination detection, leader election, fault tolerance,	**On completion of this course, the student will be able to** 1. Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc. 2. Design and develop distributed programs using sockets and RPC/RMI. 3. Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems. 4. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constrain

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.	2	3												
CO2	Design and develop distributed programs using sockets and RPC/RMI	3	2	2											
CO3	Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems	3	2	3											
CO4	Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constrain		3	3											

Unit No.	Contents	Max. Hrs.
1	**Architecture of Distributed Systems:** Characteristics of Distributed System, Motivation, challenges /Issues in the design & development of Distributed System. System Models: Architecture Model, System Architecture, Types of Architectural Model: Client server model, Search engine, Proxy server & caches, Variation on client server model: mobile code, mobile agents. Fundamental Models: Interaction model, failure model, Security model. **Distributed Objects & Distributed file system :** Inter-process communication, Sockets, middle ware, Group communication, and Remote procedure calls. CORBA, RMI, Distributed file system, Name services, Directory services, File Service types, download/upload model, File sharing semantics, session semantics, Server design: stateless & stateful server, Cache update policies.	6
2	**Theoretical Foundations:** Inherent limitations of distributed systems, Timing issues, clock synchronization, Network time protocol, Lamport's logical clocks, Vector clocks, Casual ordering of messages, Global state, Cuts of Distributed computation, Termination detection.	6
3	**Distributed Mutual Exclusion:** Leader election: Chang Robert Ring based leader election algorithm, Bully algorithm. Classification of mutual exclusion algorithms, Requirements and performance measures of mutual exclusion algorithms, Non Token Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm.Token Based Algorithms: Suzuki-Kasami's Algorithm, Raymond's Algorithm, Comparative performance analysis	6
4	**Distributed Deadlock Detection:** Resource vs Communication deadlocks, graph theoretic model, deadlock prevention, avoidance, detection, Issues in deadlock detection and resolution, Centralized deadlock detection algorithms, distributed deadlock detection algorithms	8
5	**Agreement Protocols:** Synchronous vs. asynchronous computations, model of process failures, authenticated vs. non-authenticated messages. A classification of Agreement problems, Solutions to Byzantine Agreement problem, Applicatons of Agreement algorithms.	8
6	**Failure recovery and Fault Tolerance:** Classification of failures. Backward and forward error recovery, Basic approaches of backward error recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous check pointing and recovery, asynchronous check pointing and recovery. **Fault Tolerance:** Atomic actions and committing, commit protocols, non-blocking commit protocols, Voting protocols, Dynamic voting protocols, Dynamic Vote Reassignment Protocols.	7

Text Books			
SN	**Title**	**Authors**	**Publisher**
1	Advanced Concepts In Operating Systems: Distributed, Multiprocessor and Database Operating Systems	Mukesh Singhal and Niranjan G. Shivaratri	McGraw Hill
2	Distributed Operating Systems Concepts and Design	G Coulouris, Jean Dollimore, Tim Kindberg	Addison Wesley

Reference Books			
SN	**Title**	**Authors**	**Publisher**
1	Distributed Algorithms	Nancy Lynch	Morgan Kaufman
2	Modern Operating Systems	Andrew S. Tanenbaum	Pearson Education
3	Distributed Operating Systems: Concepts and Design	Pradeep K. Sinha	Prentice-Hall of India Pvt.Ltd

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Information Technology

VII Semester

IT2433– PE V: Coding Standard and Technical Documentation

Course Learning Objective	Course Outcomes
Student will able: 1. To learn various concepts of coding & documentstandards. 2. To learn basic programming elements of Javaprogramming. 3. To apply various technical documents needed in software development. 4. To write basics of report writing.	After completion of the course: 1. Students will be able to differentiate between various programming standards and styles of programming. 2. Students will be able to write efficient Java programs based on styles of Java. 3. Students will be able to differentiate between different patterns and standards of coding in Java. 4. Students will be able to prepare better manuals, case reports and software documents.

Course Outcomes	Statement	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
IT2433.1	Students will be able to differentiate between various programming standards and styles of Programming	3.0	3.0	2.0											
IT2433.2	Students will be able to write efficient Java programs based on styles of Java	3.0	3.0		2.0	2.0									
IT2433.3	Students will be able to differentiate between different patterns and standards of coding in Java	3.0	3.0	2.0		2.0									
IT2433.4	Students will be able to prepare better manuals, case reports and software Documents	3.0				3.0									2.0
IT2433		3.0	3.0	2.0	2.0	2.3									2.0

Unit No.	Contents	Max. Hrs.
1	Introduction to general coding standards, Internal document Standards, Coding Standards: Indentation, Inline comments, procedure oriented programming, Object based programming, Structured Programming, Classes, Function, Subroutines, Methods, Source Files, and Variable Names.	5
2	Coding Guidelines: Line Length, Spacing, Wrapping Lines, Variable declarations, Program Statements, use of parentheses, Coding for efficiency vs. Coding for readability, Meaningful error messages, Reasonable sized Functions and Methods, Number of routines per File, Elements of Programming Style.	5
3	The elements of Java Style: Introduction, General Principles, Formatting Conventions, Naming Conventions: Package Names, Method Names, Constant Names. Documentation Conventions, Programming Conventions: Type safety, Statements & Expressions, Construction, Exception Handling, Assertions, Concurrency, Synchronization, Efficiency. Packaging Conventions.	6
4	Java Coding Standards: The Prime Directive: Naming conventions, Documentation, Java comments, Standards for member functions, Member function visibility, Documenting Member Functions, Techniques for writing clean code, standards for fields (Attributes/Properties), standards for local variables, Standards for parameters, Standards for classes, standards for Interfaces, standards for Packages, standards for Compilation Units (Source code file)	8
5	Introduction to Technical Writing: Prewriting, Writing & Rewriting, Objectives in technical writing, correspondence: Memos, Letters, Writing effective resumes, Visual appeal: document design, graphics, electronics communication: writing email, online help & websites, writing instructions & users manuals	8
6	Report strategies: writing research reports, feasibility reports, Lab reports, Progress reports, Writing proposals	8

Text books:

1	The elements of Programming Style	Brain W. Kernighan and P.J.Plauger	MGraw Hill
2	The elements of Java Style	Allan Vermeulen, Scoff W. Ambler, Greg Bumgardner, Eldon Metz, Trevor Misfeldt,Jim Shur, Cao Tieou	Cambridge University
3	Technical Writing Process & Product	T Sjaron J. Gerson & Steven M. Gerson	Prentice Hall

VII Semester

IT2434 – PE V: Introduction to Deep Learning

IT2434	Course name: Deep Learning		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	30	40	100	3 Hrs.

Course Learning Objective	**Course Outcomes**
Student will able: 1. To understand the theoretical foundations, algorithms and methodologies of Neural Network. 2. To provide a comprehensive foundation to artificial neural networks and their applications to pattern recognition. 3. To explore the learning paradigms of supervised and unsupervised shallow/deep neural networks. 4. To impart adequate knowledge on deep learning frameworks and their applications to solving engineering problems.	After completion of the course: 1. Comprehend the neural networks as means for computational learning and to analyze the basic network architectures and algorithms for supervised and unsupervised learning. 2. Identify the deep feed forward, convolution and recurrent neural networks which are more appropriate for various types of learning tasks in various domains. 3. Recognize the characteristics of deep learning models that are useful to solve real-world problems. 4. Identify and apply appropriate deep learning algorithms for analyzing the data for variety of problems.

	Course Outcomes	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	1	2
1		3	2	3	3									3	
2		3	2	3	3									2	
3			2		3									3	
4				3	3									2	
IT		3	2	3	3									2.5	

UNIT I		**[06 Hrs.]**
Introduction to Deep Learning, **Overview of linear algebra and probability**: Vector, Matrix, Rank, Norm, Determinant, Eigen value and Eigen vectors, Determinants. Statistics: Probability , Random variable, probability distribution, **Numerical Computation** :,Overflow and Underflow, Poor Conditioning ,Gradient-Based Optimization, Constrained Optimization, Example: Linear Least Squares		

UNIT II		**[06 Hrs.]**
Machine Learning Basics : Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Bayesian Statistics, Supervised Learning ,Unsupervised Learning ,Stochastic Gradient Descent, Challenges Motivating Deep Learning Massive parallelism • Distributed representation and computation • Learning ability • Generalization ability • Adaptability • Inherent contextual information processing • Fault tolerance • Low energy consumption		
UNIT III		**[08 Hrs.]**
feedforward neural network or multilayer perceptron, Issues with linear FFN, Design issues of feedforward network, Example: Simple feedforward network with hidden layer Regularization in DL: Norm penalties, Early stopping, Bagging, Dropout		
UNIT IV		**[06 Hrs.]**
Optimization for Training Deep Models: Challenges in Neural Network Optimization, Basic Algorithms , Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.		
UNIT V		**[06 Hrs.]**
Convolutional Neural Networks, The Basic Structure of a Convolutional Network, Training a Convolutional Network, Applications of Convolutional Networks Deep Reinforcement Learning, Stateless Algorithms, The Basic Framework of Reinforcement Learning, Policy Gradient Methods.		
UNIT VI		**[08 Hrs.]**
Recurrent Neural Networks, The Architecture of Recurrent Neural Networks, The Challenges of Training Recurrent N Restricted Boltzmann Machines, Hopfield Networks, The Boltzmann Machine, Restricted Boltzmann Machines, Applications of Restricted Boltzmann Machines networks, Applications of Recurrent Neural Networks.		

Text books:

SN	Title of Book	Edition	Author	Publication
1	Deep Learning	Latest Edition	Ian Goodfellow Yoshua Bengio Aaron Courville	MIT Press
2	Neural Network and Deep Learning	1st Edition	Charu C Agarwal	Springer

Referrence books:

SN	Title of Book	Edition	Author	Publication
1	Neural Networks and Learning Machines	Third Edition	Simon Haykin	Pearson, Prentice Hall

VII Semester

IT2435 – PE V: Wireless Sensor Network

IT2435	Course name: Wireless Sensor Netwrok		L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSE-I	MSE-II	TA	ESE	Total	ESE Duration
	15	15	30	40	100	3 Hrs.

Course Learning Objective	**Course Outcomes**
Student will able: 1. To make students understand the basics of Wireless sensor Networks. 2. To familiarize with learning of the Architecture of WSN. 3. To understand the concepts of Networking and Networking in WSN. 4. To study the design consideration of topology control and solution to the various problems. **5.** To introduce the hardware and software platforms and tool in WSN.	After completion of the course: 1. Understand challenges and technologies for wireless networks and architecture and sensors 2. Describe the communication, energy efficiency, computing, storage and transmission, communication, energy efficiency, computing, storage and transmission 3. Establishing infrastructure and simulations 4. Explain the concept of programming the in WSN environment

	Course Outcomes	Mapped PO												PSO	
		1	2	3	4	5	6	7	8	9	10	11	1	1	2
1		3	2	3	3									3	
2		3	2	3	3									2	
3			2		3									3	
4				3	3									2	
IT		3	2	3	3									2.5	

UNIT I		**[09 Hrs.]**
OVERVIEW OF WIRELESS SENSOR NETWORKS : SingleNode Architecture Hardware Components Network Characteristics unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks Types of wireless sensor networks.		

UNIT II		**[06 Hrs.]**
ARCHITECTURES: Network Architecture Sensor NetworksScenarios Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments introduction to Tiny OS and nesC Internet to WSN Communication.		
UNIT III		**[08 Hrs.]**
NETWORKING SENSORS : MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – SMAC, BMAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.		
UNIT IV		**[06 Hrs.]**
INFRASTRUCTURE ESTABLISHMENT : Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.		
UNIT V		**[06 Hrs.]**
SENSOR NETWORK PLATFORMS AND TOOLS : Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node level software platforms, Node level Simulators, State centric programming.		
UNIT VI		**[08 Hrs.]**
Naming and addressing : Fundamentals, address and name management, Assignment of MAC address,Distributed assignment of locally unique addresses, content based and geographic addressing. Naming and addressing :Fundamentals, address and name management, Assignment of MAC address, Distributed assignment of locally unique addresses, content based and geographic addressing.		

Text books:

SN	Title of Book	Edition	Author	Publication
1	Protocols And Architectures for Wireless Sensor Networks	2005	Holger Karl & Andreas Willig	John Wiley
2	Wireless Sensor Networks An Information Processing Approach	2007	Feng Zhao & Leonidas J.Guibas	Elsevier
3	Fundamentals of Wireless Sensor Networks Theory and Practice	2011	Waltenegus Dargie Christian Poellabauer	John Wiley & Sons Publications

Reference books:

SN	Title of Book	Edition	Author	Publication
1	Wireless Sensor Networks-Technology, Protocols, and Applications	2007	Kazem Sohraby, Daniel Minoli, & Taieb Znati	John Wiley
2	Wireless Sensor Network Designs	2003	Anna Hac	John Wiley

WEB LINKS FOR REFERENCE

1. https://nptel.ac.in/courses/106/105/106105160/
2.https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
3. https://cse.iitkgp.ac.in/~smisra/course/wasn.html

VII Semester
IT2441– PE VI: Advanced Computer Architecture

Objective	Course Outcome
The student should be able to 1) To understand the basic concept of different computer architecture and parallelism. 2) To study of different pipelining processor and its applications. 3) To understand the basic concept of array processor and SIMD. 4) To understand basic concept of Multiprogramming/Multiprocessing Architecture. 5) To study different data dependence for improvement of system performance. 6) To understand different techniques of parallelism and its extraction.	**On completion of this course, the student will be able to** 1) Analyze different computer architecture and its parallelism. 2) Apply different pipelining techniques in an application. 3) Discuss the basic concept of array processor and SIMD architecture. 4) Apply the knowledge of Multiprogramming/Multiprocessing processing for improvement of system performance. 5) Analyze different data flow dependent and it effects on parallelism. 6) Apply different parallelism techniques and its extractions to application

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	Analyze different computer architecture and its parallelism.		2												2
CO2	Apply different pipelining techniques in an Application.	3													3
CO3	Discuss the basic concept of array processor and SIMD architecture.		2												2
CO4	Apply the knowledge of Multiprogramming/Multiprocessing processing for improvement of system performance.	3	3												3
CO5	Analyze different data flow dependent and it effects on parallelism	3													3

CO6	Apply different parallelism techniques and its extractions to application		2												3

Unit No.	Contents	Max. Hrs.
1	Introduction to parallel processing : memories and IO subsystem : Evolution of computer system, parallelism in uniprocessor system, parallel computer structure, architecture classification schemes, parallel processing application, Hierarchical memory structure, virtual memory system, memory allocation and , management, I/O subsystem.	10
2	Pipelining and vector processing : Pipeline, overlapped pipelining, instruction and arithmetic pipelining, pipelined processor, vector processing, vector processor, architecture of cray-1, parallel memory organization	8
3	Array Processor : SIMD array processor, (organization and inter connection networks), Parallel algorithms for array processor, SIMD matrix multiplication, parallel sorting on array processor, associative array processing, associative memory organization associative processors.	8
4	SIMD Computer and Multiprocessor Architecture : III IAC-IV System architecture and its applications, performance enhancement methods, parallel memory allocation, array processing, languages, multiprocessors, loosely and tightly coupled multiprocessor, time shared and crossbar interconnection networks, parallel memory organization, interleaved memory configuration.	8
5	Multiprocessing control and Data Flow Computers: Intercrosses communication mechanisms system deadlocks and protection parallel algorithms for multiprocessors, classifications of parallel algorithms data driven computing, data flow computer architecture.	8
6	Techniques for Extraction of parallelism.	5

Text Books

SN	Title	Authors	Publisher
1	Advanced Computer Architecture	Kai Hwang	McGraw-Hill

Reference Books

SN	Title	Authors	Publisher
1	Computer Architecture and Parallel Processing	Hwang & Briggs	Mc-Graw Hill Pub
2	"Computer Architecture :A Quantitative Approach"	John Hennessy David Patterson	Morgan Kaufmann

VII Semester

IT2442 – PE VI: Mobile Communication

Objective	Course Outcome
The student should be able to 1. Student will be able to study evolution of wireless telecom system. 2. Student will be able to study the concepts employed in wireless LAN systems and Protocol Architecture. 3. Student will be able to study the Ad Hoc networks and new trends in Mobile/wireless communication. 4. Student will be able to study the TCP and Mobile IP concepts.	**On completion of this course, the student will be able to** 1. Understand different wireless mobile architecture. 2. Understand control mechanism and Radio Interfaces. 3. Understand the concepts of Adhoc Network. 4. Understand the need and the trend toward mobility.

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO	Understand different wireless mobile architecture	3	3												
CO	Understand control mechanism and Radio Interfaces.	3													
CO	Understand the concepts of Adhoc Network.	3		2											
CO	Understand the need and the trend toward mobility	3				2									

Unit No.	Contents	Max. Hrs.

1	Review of radio transmission, antennas, modulation & demodulation, Radio propagation. Concept of cellular working, Multiplexing in space, frequency time, Code division multiplexing, Spread spectrum medium access methods.	6
2	Wireless telecom Systems: Evolution, study of 2G system GSM. Network architecture, radio interface, System's internal interfaces, role of VLRs & HLRs. Handover algorithms, security, Operation Maintenance systems	6
3	3G Systems & beyond : Evolution towards 3G systems based on GSM & CDMA networks. Radio interface, system internal functioning, handover scenarios, security,	6
4	Wireless LAN systems : Medium access control mechanism in 802.11 networks. Radio interface, protocol architecture.	5
5	Mobile adhoc networks. Networking with a view of 4G Wireless Imperatives and Challenges ,Algorithms for routing & overall network function. Mobile satellite networks.	6
6	Support for mobility : Mobile IP, TCP for mobile hosts. Other developments in the TCP/IP stack for mobility support, Introduction to IoT, Introduction to 5G Technology.	5

Text Books

SN	Title	Authors	Publisher
1	Mobile Communications	J.Schiller	Pearson Education
2	Mobile and Personal Communication Systems & Services	Raj Pandya	Prentice Hall

Reference Books

SN	Title	Authors	Publisher
1	Mobile Ad Hoc Networking	Stefano Basagni,Marco Conti	Wiley India Edition

VII Semester

IT2443 – PE VI: E-commerce

Objective	Course Outcome
The student should be able to 1) To understand the scope of e-commerce in the realm of modern Business. 2) To learn the marketing methods& Business strategies used in e-commerce. 3) To know how the electronic data interchange and how to manage commerce solutions 4) Understand the security threats &electronic payment system	**On completion of this course, the student will be able to** **1.** Understand of contemporary ecommerce concepts and terminology, and the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web. 2. Analyze and understand the human, technological and business environment associated with e-commerce. 3. Define and analyze the concept of electronic data interchange and its legal, social and technical aspects. 4. Define and analyze the security issues over the web, the available solutions, future aspects of e-commerce security, concept of E-commerce and electronic payment system.

CO	Statement	Mapped PO											PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO	Understand of contemporary ecommerce concepts and terminology, and the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web.	2	2												
CO	Analyze and understand the human, technological and business environment associated with e-commerce.	3	3												
CO	Define and analyze the concept of electronic data interchange and its legal, social and technical aspects.	3	3				3								
CO	Define and analyze the security issues over the web, the available solutions, future aspects of e-commerce security, concept of E-commerce and electronic payment system	2	3				3							2	

Unit No.	Contents	Max. Hrs.
1	Internet &Introduction to Electronic Commerce: The basics of internet access, email, FTP, TELNET, Introduction to WWW: The basics of WWW & browsing working of Web Browser & Web Server, Web Browser architecture. Introduction to Electronic Commerce: The scope of Electronic Commerce, Definition of Electronic Commerce, Electronic Commerce and the Trade.	7
2	Business Strategy in an Electronic Age: The Value Chain System, Competitive Advantage, Business Strategy, Introduction to Stock-Keeping Unit (SK).	7
3	Business to Business Electronic Commerce: Inter-organisational Transactions, Electronic Markets, Electronic Data Interchange, EDI: EDI Technology, EDI Standards, EDI, Communication, EDI Implementation, EDI Security, EDI and Business, Inter-organisational e-Commerce.	8
4	Business to Consumer Electronic Commerce: Consumer Trade transactions, What you want, when you want it, internet e-commerce, Internet Shopping and the Trade cycle, Advantage and Disadvantage of Consumer e-commerce.	7
5	The Elements of e-Commerce & e-Business: Elements, e-Visibility, The e-shop, Online Payments, Delivering the Goods, After-Sales Service. e-Business: Introduction, Internet Bookshops, Software Supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the Net.	7
6	Security Threats to E-Commerce, Electronic Payment Systems (EPS).	6

Text Books

SN	Title	Authors	Publisher
1	E-Commerce	David Whiteley	McGrew Hill Pub
2.	Electronic Commerce	Gary P. Schneider & James T. Perry	Course Technology

Reference Books

SN	Title	Authors	Publisher
1	Teach Yourself Web Technologies -Part 1	Ivan Bayross	BPB Publications
2	Web Technologies TCP/IP Architecture, and Java Programming	Achyut S. Godbole and Atul Kahate	McGraw-Hill Education (India)

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Information Technology

VII Semester

IT2444 – PE VI: Natural Language Processing

Objective	Course Outcome
The student should be able to **1.** Know fundamental concepts and techniques of natural language processing (NLP). 2. Recognize the significance of pragmatics for natural language understanding. 3. Describe the application based on natural language processing	**On completion of this course, the student will be able to** 1. Understand approaches to syntax and semantics in NLP. 2. Understand the concepts behind n-gram models. 3. Understand approaches to POS tagging, Word sense disambiguation, summarization and information retrieval within NLP. 4. Understand machine learning techniques used in NLP, including hidden Markov models.

CO	Statement	Mapped PO												PSO	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO	Understand approaches to syntax and semantics in NLP	**3**	**3**												
CO	Understand the concepts behind n-gram models	**3**													
CO	Understand approaches to POS tagging, Word sense disambiguation, summarization and information retrieval within NLP.	**3**		**2**											
CO	Understand machine learning techniques used in NLP, including hidden Markov models.	**3**				**2**									

Unit No.	Contents	Max. Hrs.
1	Introduction: What is Natural Language Processing, Brief history of the NLP, Stages of NLP,Applications of NLP, Challenges for NLP, Approaches to NLP .introduction to word tokenization, sentence segmentation, stemming, word normalization.	6
2	Language Models: The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.	6
3	Part Of Speech Tagging and Sequence Labeling: Lexical syntax. Hidden Markov Models. Morphology analysis(Indian languages),Accuracy measures.	6
4	Word net and Word sense Disambiguation: Supervised , unsupervised methods and semi supervised methods. Resource-Constraints WSD, Word embedding and phrase embedding.	5
5	Pragmatics Discourse: Coreferences, reference resolution, reference phenomenon, syntactic and semantic constraints on co reference.	6
6	Natural language Processing applications (Indian regional languages): Sentiment Analysis, Text Entailment, Robust and Scalable Machine Translation, Question Answering in Multilingual Setting.	5

Text Books

SN	Title	Authors	Publisher
1	Speech and Language processing	Daniel Jurafsky and James H. Martin (ISBN13: 978-0131873216)	Prentice Hall, 2008

Reference Books

SN	Title	Authors	Publisher
1	Natural Language Processing with Python	Steven Bird, ewan Klein, and Edward Loper	Reilly Media, 2009

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Information Technology

VII Semester

IT2409– Mini Project

COURSE OBJECTIVES	COURSE OUTCOME
1. To apply knowledge of mathematics, science and engineering in a global, economic, environmental and societal context and engage in life-long learning. 2. To design a model, a system or components considering environmental, economic, social, political, ethical and sustainability and analyze and interpret the data. 3. To work on multidisciplinary teams, tackle engineering problems, understand professional and ethical responsibility and communicate effectively. 4. To apply knowledge of contemporary issues and use the techniques, skills, and modern engineering tools necessary for engineering practices.	On successful completion of the course students will be able to: 1. Understand the knowledge gained from the various courses undergone in earlier years. 2. Able to work in team and adapt professional ethics and practice and how to write technical documents in professional style, and to demonstrate the product/software to technical audience. 3. Able to evaluate and analyze critically evaluate and analyze different sources of data available in the literature. 4. Able to learn and to apply the knowledge of tools/Technology.
Mapped Program Outcomes : 1,2,3,4,5,6,7,8,9,10,11,12 **PSO** : i,ii	

The students group will be formed by the project coordinator, based on the field of interest project guides will be allotted to the groups. Students need to carry the literature survey and implementation under the guidance of their project guides. Project groups' needs to submit a project report based on their studies. Evaluation will be done continuously and viva voce conducted at the end of the semester.

VII Semester
IT2410 - Campus Recruitment Training (CRT)

COURSE OBJECTIVE	COURSE OUTCOMES
1. To get information about latest methodologies and techniques used in the field of civil engineering. 2. To understand current practices adopted in construction management.	1. An ability to prepare detail notes and reports. 2. An ability to communicate effectively. 3. An ability to implement the field knowledge to the practical applications.
Mapped Program Outcomes : 1,2,5,10,11	

Student would be required to undergo a practical training for two months during the summer vacation after 6th semester. They would submit a report about the same and also make the presentation for evaluation.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

BE SoE and Syllabus 2018

(Revised Scheme of Examination w.e.f. 2021-22 onward)

Information Technology

VIII Semester

IT2451– Major Project (Semester Long Internship)

COURSE OBJECTIVES	COURSE OUTCOME
1. To apply knowledge of mathematics, science and engineering in a global, economic, environmental and societal context and engage in life-long learning. 2. To design a model, a system or components considering environmental, economic, social, political, ethical and sustainability and analyze and interpret the data. 3. To work on multidisciplinary teams, tackle engineering problems, understand professional and ethical responsibility and communicate effectively. 4. To apply knowledge of contemporary issues and use the techniques, skills, and modern engineering tools necessary for engineering practices.	On successful completion of the course students will be able to: 1. Understand the knowledge gained from the various courses undergone in earlier years. 2. Able to work in team and adapt professional ethics and practice and how to write technical documents in professional style, and to demonstrate the product/software to technical audience. 3. able to evaluate and analyze critically evaluate and analyze different sources of data available in the literature. 4. able to learn and to apply the knowledge of tools/Technology.
Mapped Program Outcomes : 1,2,3,4,5,6,7,8,9,10,11,12 **PSO** : i,ii	

The students will appear for the entrance examination of industry for Internship. After selection, students will join industry for a semester as a intern and will continue the project allotted by the industry and also will submit a project report based on their studies. Evaluation will be done continuously and viva voce conducted at the end of the semester.

VIII Semester
IT2452 - Extra-Curricular Activity Evaluation

COURSE OBJECTIVES	COURSE OUTCOME
1. To organize co-curricular activities to make competitive spirit, cooperation, leadership, diligence, punctuality, team spirits. 2. To develop creative talent, self-confidence, sense of achievement. 3. To be able to design process on environmental, social, political, ethical, health and safety. 4. To develop broad education to understand the impact of engineering solution in a global economic, environmental, society.	1. An ability to work initially as well as part of team to achieve set goals. 2. An ability to work to serve society and for betterment of society. 3. An ability to communicate with people at large.
Mapped Program Outcomes : 1,2,3,45,6,7,9,10,11	

Due credits will be given to the students based on their performance and involvement in different extra and co-curricular activities conducted within the college or by other organizations/ institutions. Due credit will also be given to the student if they are successful in different competitive examinations conducted by different organizations. The guidelines as given in academic regulations will be followed for evaluation.