Bachelor of Technology

SoE & Syllabus 2021

1st Semester

(Department of Computer Science & Engineering
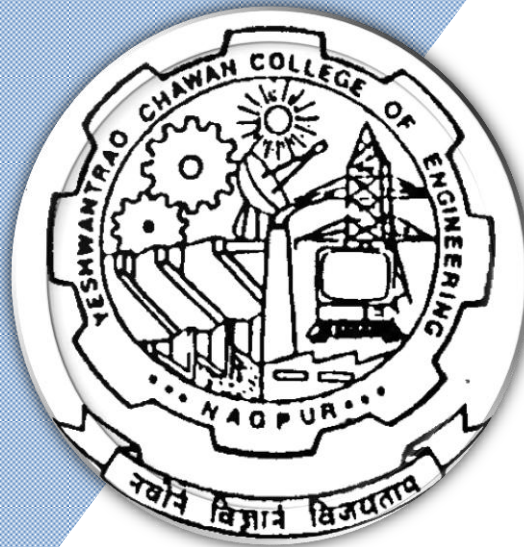**(CSE)Artificial Intelligence & Machine Learning**

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					First Semester										
1	1	BS	GE	AIML2101	Calculus, Sequeces and Series	T	3	0	0	3	3	30	20	50	3 Hours
2	1	HS	GE	AIML2102	Technical Communication	T	3	0	0	3	3	30	20	50	3 Hours
3	1	HS	GE	AIML2103	**Lab:** Technical Communication	P	0	0	2	2	1		60	40	
4	2	BES	CSE	AIML2104	Computer Workshop	P	0	0	2	4	2		60	40	
5	1	BES	CSE	AIML2105	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hours
6	1	BES	CSE	AIML2106	Lab: Programming for Problem Solving	P	0	0	2	2	1		60	40	
7	1	BS	GE	AIML2107	Applied Chemistry	T	3	0	0	3	3	30	20	50	3 Hours
8	1	BS	GE	AIML2108	**Lab.:** Applied Chemistry	P	0	0	2	2	1		60	40	
					TOTAL FIRST SEM		12	0	8	22	17				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits				
1	1	HS	GE	GE2131	Universal Human Value	T	2	0	0	0	0				
2	1	HS	GE	AU2121	YCCE Communication Aptitude Preparation (YCAP1)	A	3	0	0	3	0				
3	2	HS	GE	AU2122	YCCE Communication Aptitude Preparation (YCAP2)	A	3	0	0	3	0				

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Second Semester										
1	2	BS	GE	AIML2151	Probability and Statistics	T	3	0	0	3	3	30	20	50	3 Hours
2	2	BS	GE	AIML2152	Applied Physics	T	3	0	0	3	3	30	20	50	3 Hours
3	2	BS	GE	AIML2153	**Lab:** Applied Physics	P	0	0	2	2	1		60	40	
4	2	BES	EE	AIML2154	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
5	2	BES	EE	AIML2155	**Lab:** Digital Electronics	P	0	0	2	2	1		60	40	
6	2	BES	CSE	AIML2156	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	2	BES	CSE	AIML2157	**Lab:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	2	BES	CSE	AIML2158	Web Technology Lab	P	0	0	0	2	2		60	40	
9	2	HS	GE	AIML2159	Constitution of India	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL SECOND SEM		15	0	6	23	20				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

		June 2022	1.01	
Chairperson	Dean (Acad. Matters)	Date of Release	Version	Applicable for AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

I Semester
AIML2101: Calculus, Sequences and Series

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To give basic knowledge of sequence and Series. 2) To explain differential calculus and its applications. 3) To extend the concept of integration to double and triple integrals. 4) To teach various methods for solving higher order differential equations and its applications.	1) Apply the knowledge of differentiation, sequence and series to solve engineering problems. 2) Determine the expansion and derivatives of functions of several variables and use it to find extreme values of functions. 3) Evaluate the improper integrals, multiple integrals and apply it to compute the area and volume of various structures. 4) Solve higher order differential equations and its applications.

Unit No.	Contents	Max. Hrs.
1	**Sequence and Series** Sequence, types of sequence, test of convergence of sequences, Cauchy sequence, infinite series, power series, Alternating series, tests of convergence and absolute convergence of series.	6
2	**Ordinary Differentiation** Successive differentiation; Leibnitz theorem, Taylor's and Maclaurin's series for functions of single variable and its applications.	7
3	**Partial Differentiation** First and higher order derivatives of Functions of several variables, Euler's theorem, Chain Rule, Jacobians, Maxima and minima and saddle point of functions of two variables.	7
4	**Curve Tracing and Improper Integrals** Tracing of curves, Beta, Gamma functions and its applications.	6
5	**Multiple integrals** Elementary double integrals, Change of variables (simple transformations), Coordinate Transformation, Change of order of integration (Cartesian and polar), Elementary triple integrals and Applications to find area, volume.	7
6	**Differential Equations** Higher order differential equations with constant coefficients. Cauchy's and Legendre's homogeneous differential equations, Applications of differential equations	6

Text Books				
SN	Title	Edition	Authors	Publisher
1	Advance Engineering Mathematics by	6th	Erwin Kreyzig,	John Wiley and Sons,INC.
2	Engineering Mathematics	11th revised edition, 2003	H.K. Dass	S.Chand, Delhi.

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

SN	Title	Edition	Authors	Publisher
3	Advanced Engineering Mathematics	8th Ed, 2007	H.K. Dass	S.Chand, Delhi.
4	Engineering Mathematics	43rd edition	Dr. B.S. Grewal	
5	Applied Mathematics	4th Edition	P.N.Wartikar and J.N.Wartikar,,Pune	Vidyarthi Griha Prakashan, Pune

Reference Books

SN	Title	Edition	Authors	Publisher
1	Calculus and Analytical Geometry,	9th ed,	G B Thomas and R L Finney:	Addison-Wesley, 1999.
2	Calculus	(Vols I and II)	Michael Spivak and Tom Apostol	
3	A text book of Engineering Mathematics	10th	N.P. Bali and Manish Goyal,	

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
AIML2102: Technical Communication

Objective	Course Outcome
The student should be able to 1) To Explain the fundamentals of communication 2) To Classify the different speech sounds of English 3) To Apply Different components of oral communication 4) To Draft technical documents	**On completion of this course, the student will be able to** 1) Apply different modes for effective communication 2) competently use the phonology of English language 3) Apply nuances of LSRW skills 4) Communicate through different channels

Unit No.	Contents	Max. Hrs.
1	**Basics of Communication** Language as a tool of communication & characteristics of language Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Classification of Barriers (Intrapersonal, Interpersonal, Organizational).	6
2	English Phonetics Speech Mechanism, Organs of speech, Consonant and Vowels sounds, Word stress rules	6
3	Interview Skills Purpose , expectations of employer and preparation for Interview, Types, Types of Questions & Answering Techniques, Telephonic Interviews – preparation and guidelines, Reading Techniques (Exercise based on Complex Unseen passages	5
4	Oral Skills Group Communication- (Purpose, Different types of Group Communication, Organizational GD, GD as a part of selection process), Meeting (purposes, preparation, procedure and minutes of meeting), Listening Skills -definition types and traits	6
5	Presentation & Visual Communication Presentation and audience analysis, Organizing content, Nuances of presentation, Visual Communication – Introduction & importance, Role & Psychology of color in visual communication.	6
6	Technical Written Communication Memo, Email, Report -Types, Characteristics, prewriting aspects of report and preparing writing aspects of report), Types of paragraphs.	6

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

Text Books

SN	Title	Edition	Authors	Publisher
1	Technical Communication	3rd Edition	Raman &Sharma	Oxford University Press.
2	Textbook of English Phonetics for Indian Students	3rd Edition	T. Balasubramaniam	Macmillan India Ltd.

Reference Books

SN	Title	Edition	Authors	Publisher
1	How to Develop Self – Confidence & Influence People by Public Speaking	1st Edition	Dale Carnegie	Simon & schuster
2	Communication Skills,	2nd Edition	Asha Kaul	PHL learning
3	Body Language,	1st Edition	Allen Peas	Sheldon prss
4	Technical Communication	January 2003	Gerson's Gerson –	Longman publishing group

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
AIML2103: Lab.: Technical Communication

Sr.No	List of Experiment	Max. Hrs.
1	Hands on for Consonants and vowel sounds	6
2	Identifying the pragmatic meaning of the text	6
3	Mock Sessions for Mock Sessions for Interview	5
4	Grooming session for effective use of body language	6
5	Visual Media – preparing poster boards, advertising product	6
6	Group Discussion	6

Text Books:

SN	Title	Edition	Authors	Publisher
1	Technical Communication	3rd Edition	Raman & Sharma,	Oxford University Press
2	Textbook of English Phonetics for Indian Students	3rd Edition	T. Balasubramaniam,	Macmillan India Ltd

Reference Books:

SN	Title	Edition	Authors
1	How to Develop Self – Confidence & Influence People by Public Speaking	1st Edition	Dale Carnegie
2	Communication Skills	2nd Edition	Asha Kaul
3	Body Language	1st Edition	Allen Peas
4.	Technical Communication	January 2003	Gerson'sGerson

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
AIML2104: Lab.: Computer Workshop

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To impart basic knowledge of Computer Hardware and Networking Components.	1) To understand the Computer Hardware and networking components and their interconnection
2) To impart operational knowledge of Linux/UNIX System features and Shell commands	2) To work with Linux/UNIX System using shell commands
3) To introduce useful software tools such as Excel and JASON format	3) To learn to use software tools such as Excel, JASON format, etc.

List of Practical's

Sr.No.	Problem Statements
1	Study of Personal Computer Hardware: Assembling a Personal Computer PC Hardware Components Study of BIOS and its working
2	Introduction to Networking Networking Devices Communication Channels Networking Topologies Types of Computer Networks
3	Introduction to LINUX/UNIX Operating System with its important features and directory structure
4	Introduction to Linux shell commands with pipes and redirection
5	Introduction to JSON format and its applications
6	Introduction to Mind Maps using tools such as Mindmeister
7	Working with Excel and creating useful work sheets

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
AIML2105: Programming for Problem Solving

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To impart basic knowledge of Computer Systems and Computer programming 2) To inculcate problem solving ability using various C language features	1) To understand the basics of computer system components and operation, basics of algorithms and flowcharts 2) To design & develop programs using conditional statements and loops. 3) To design & develop user defined functions, understand the concept of modular programming and pointers. 4) To understand and analyze single and multi-dimensional arrays as a data structure and its use in problem solving. 5) To understand the basics of Strings, Structures, Unions, and File handling and its use for problem solving. 6) To understand the given problem statement and write programs to solve real-life problems.

Unit No.	Contents	Max. Hrs.
1	**Computer System Basics:** Introduction to components of a computer system (disks, memory, processor), how program is executed, understanding of concepts such as operating system, compilers, source and object programs, etc. Introduction to algorithms and flowcharts. **Basic building blocks of C:** Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, precedence of operators	6
2	Expressions, sizeof() operator, constants, typedef statement, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions, writing straight line programs.Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement.	6
3	**Loop Structures:** While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, bitwise operators, real life programming examples.	6
4	**Modular programming:** Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, Concepts of a pointer, call by reference, types of programming errors, real life programming examples	7

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

Unit No.	Contents	Max. Hrs.
5	**Arrays:** One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting techniques – Bubble sort , and selection sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. Strings: string representation and string handling functions, real life programming examples	7
6	Structure and Union, Concepts of files, Types of files, file opening in various modes, file opening and closing, fseek(), reading and writing text files, concept of pre-processor directives and macros, command line arguments, real life programming examples	7

Text Books

SN	Title	Edition	Authors	Publisher
1	Mastering C	2nd	K.R.Venugopal & S.R. Prasad	TMH,2007.
2	Programming in ANSI C	8th reprint	E. Balaguruswamy	Mc Graw Hill Education
3	The C Programming Language.	2nd	J.B.W.Kernighan & D.M.Ritchie	Prentice Hall

Reference Books

SN	Title	Edition	Authors	Publisher
1	Problem Solving And Program Design In C	8th	Jeri. R. Hanly, Elliot B. Koffman	Pearson Education
2	Programming with C	4th	Byron Gottfried	Schaum;s Outline Series
3	How to solve it by computers	1st -2006	R. G. Dromey	Prentice Hall India

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

I Semester
AIML2106: Lab.: Programming for Problem Solving

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To write, compile and execute C programs. 2) To inculcate problem solving ability using various C language features	1) To develop and run C programs on Linux system 2) To develop programs using conditional statements and loops. 3) To develop user defined functions required to solve a given problem 4) To understand and use single and multi-dimensional arrays as a data structure for problem solving. 5) To understand the basics of Strings, Structures, Unions, and File handling and its use for problem solving. 6) To understand the given problem statement of a real-life problem and write a program to solve it.

List of Practical's

Sr. No..	Problem Statements
1	Introduction to Linux Operating system & its different commands.
2	Introduction to editor, Compilation and Execution of a program in Linux
3	a) Write a C program to display Your Name, Address and City in different lines. b) Write a C program to convert centigrade into Fahrenheit. Formula: C= (F-32)/1.8.
4	Write program using conditional operators to evaluate the following function and print the value of y. $y = 2.4x + 3$, for $x \le 2$ $y = 3x - 5$, for $x > 2$
5	Write a program to implement the following table, which tries to predict if a customer would buy a product. In particular, you need to ask for inputs Age, Gender and City, and print one of the three outputs Yes, No or Cannot Say. <table><tr><td>Age</td><td>Gender</td><td>City</td><td>Will Buy?</td></tr><tr><td>25-30</td><td>M</td><td>Chennai</td><td>Yes</td></tr><tr><td>33-45</td><td>F</td><td>Bangalore</td><td>Yes</td></tr><tr><td>57-80</td><td>F</td><td>Chennai</td><td>No</td></tr><tr><td>25-30</td><td>F</td><td>Hyderabad</td><td>No</td></tr><tr><td>13-19</td><td>M</td><td>Bangalore</td><td>Yes</td></tr><tr><td>16-20</td><td>M</td><td>Chennai</td><td>No</td></tr></table>

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

Sr. No.	Problem Statements
6	Write a menu driven program to perform following operations. 1) To display maximum number among inputted three number. 2) To display the final prize based on assumption that if total purchase price is above 2500 rs then discount is 25% and if total prize is above 5000 then discount is 30% else 40% discount. 3) To Display percentage of 2nd number to 1st number if two numbers is entered by the user. 4) Exit.
7	Write a program print whether entered number is Prime or not
8	Write a program to print the sum of exponential series $e(x) = 1 + x/1! + x2 / 2! + x3 / 3! + \ldots \ldots$
9	Write a program to print the given number pyramid
10	Write a program in C that will scan a number N and then output the sum of the powers from 1 to N. thus, if the input is 4, the output should be 288. E.g. $(1)^1 + (2)^2 + (3)^3 + (4)^4 = 1 + 4 + 27 + 256 = 288$ [1,2,3,4] Write a recursive function to print Factorial of a entered number. Use power function to calculate the power of number. Write a recursive function to print Factorial of a entered number.

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
AIML2107: Applied Chemistry

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To impart intensive and extensive knowledge of the subject enriching students to understand the role of Chemistry in the field of engineering. 2) To keep students abreast with the latest developments and applications of modern materials. 3) To gain basic principles, instrumentation and applications of analytical techniques.	(1) Interpret different thermodynamic functions. (L2) (2) Describe basic concepts of electrochemistry and apply the knowledge for energy storage devices. (L3) (3) Illustrate chemical reaction rate (L3) (4) Classify advanced engineering materials in technological applications. (L2) (5) Develop analytical and instrumental skills. (L3)

Unit No.	Contents	Max. Hrs.
1	**Energetics**: Introduction, Internal energy, enthalpy, Gibb's free energy, Free energy change and chemical equilibrium. Spontaneous and non-spontaneous processes. I and II law of thermodynamics. Entropy and its significance. Numericals on Internal energy and enthalpy change. Thermodynamic applications to physical and chemical equilibrium.	07
2	**Electrochemistry**: Introduction, metallic and electrolytic conductance, resistance, specific resistance, conductance, specific conductance, equivalent and molar conductance. Variation of conductance with dilution. Electrode and electrode potentials. Nernst Equation. Faraday's laws and Numericals.**Industrial applications**: Electroforming, Electrowinning, Electrolytic refining.	06
3	**Energy Storage Devices** **Basic concepts**: Primary and secondary battery. Energy density, power density, energy efficiency, cycle life, shelf life.Secondary battery: Ni-metal hydride battery, Lithium-ion battery. **H_2-O_2 Fuel cell**: Principle, working, advantages, disadvantages, applications. Differences between battery and a fuel cell.**Supercapacitors**: Definition, types, characteristics and application.	06
4	**Chemical Kinetics** : Introduction, Rate of reaction and factors influencing rate of reaction, order & molecularity of reaction.Kinetic equations of different orders: Zero Order, First Order, Second Order and numericals.	06
5	**Spectroscopic Techniques and Applications** Fundamentals of spectroscopy, types of spectroscopy, aim of spectroscopy. **UV-Visible spectroscopy**: Basic principle, Lamberts Beers law, applications. **IR spectroscopy**: Introduction and Application **NMR**: Basic principle, chemical shift, Application Fundamentals of X-Ray Diffractions (XRD) spectroscopy	07

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

Unit No.	Contents	Max. Hrs.
6	**Advanced Materials :** **Nanomaterials**: Definition of nanomaterials, nano scale. Carbon Nanotubes and types. **Application of Nanomaterials**: Applications of nanomaterials in medicine, environment, and electronics. Nanotechnology for waste reduction and improved energy efficiency. Elementary ideas and applications of Nano biopolymers, Nano fertilizers and Nano ceramics. Threats of Nanomaterials. **Silicon Chips:** Introduction. Physical, chemical, electrical & mechanical properties. Applications. **Chemical sensors**: Types and application	07

Text Books

SN	Title	Edition	Authors	Publisher
1	A Textbook of Engineering Chemistry	Eleventh Edition.	S S. Dara	S.Chand & Co New Delhi
2	Engineering Chemistry	Sixteenth Edition	Jain & Jain	Dhanpat Rai & sons New Delhi.
3	Physical Chemistry	(Eighthedition-2006).	P. W. Atkins	Oxford Publications
4	Engineering Chemistry	First edition	B.Sivasankar	Tata McGraw-Hill

Reference Books

SN	Title	Edition	Authors	Publisher
1	Chemistry in Engineering	First edition	Lloyd A.Munro	Prentice-hall
2	Applied chemistry for engineers	First edition	T.S.Gyngell	Edward Arnold and Co
3	Engineering Chemistry	First edition	B.K.Sharma	Krishna Prakashan media private LTD
4	Chemistry of Advanced Materials	First edition	CNR Rao	RSC Publications
5	Handbook of Semiconductor Silicon Technology	First edition	William C. O'Mara, Robert B. Herring	Noyes Publications Park Ridge, NJ, USA.
6	Fundamentals of Molecular Spectroscopy	First edition	C.N. Banwell	McGraw hill education

Website / Data sheet:

SN	Title
1	Silicon Chips: What are Computer Chips Made Of? https://www.intel.com/content/www/us/en/history/museum-making-silicon.html
2	What is silicon, and why are computer chips made from it? https://www.extremetech.com/extreme/208501-what-is-silicon-and-why-are-computer-chips- made-from-it

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE (AIML)

I Semester
AIML2108: Lab.: Applied Chemistry

Objective	Course Outcome
The student should be able to Develop analytical ability Integrate chemistry fundamentals with practical applications	**On completion of this course, the student will be able to** 1) Describe basic concepts of electrochemistry and apply the knowledge for energy storage devices. (L3) 2) Classify advanced engineering materials in technological applications. (L2) 3) Develop analytical and instrumental skills. (L3).

List of Practical's

Sr. No.	Problem Statements
	Name of Experiment (Minimum 4 experiments from Group I & II each andDemonstrations on 2 experiments should be conducted)
	Group I:
1	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution
2	Estimation of NICKEL by complexometry
3	Determination of copper by iodometric titration
4	Estimation of Fe^{2+} ions by redox titration
5	Estimation of Fe^{3+} ions by spectrophotometric method
6	Synthesis of urea formaldehyde resin.
	Group II:
7	Preparation of Printed Circuit Board.
8	Determination of molecular weight of a olymer using Ostwald's viscometer
9	Determination ofion exchangecapacity of a cation exchange resin
10	Proximate analysis of coal.
11	Determination of thinner contain in oil paint
12	Electroplating Copper on Stainless steel.
	Demonstration:
13	Determination of Faradays first law.
14	Determination of Faradays second law.
15	Determination of conductivity of water sample by conductivity meter

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

I Semester
GE2131: Universal Human Value (Audit Course)

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS'	1) Experiential validation through the way to verify right or wrong.
2) To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity	2) Practice living in harmony with natural acceptance
3) To highlight plausible implications of Holistic understanding in terms of ethical human conduct.	3) Understand the importance of relationships.

Unit No.	Contents	Max. Hrs.
1	**Course Introduction** **Need, Basic Guidelines, Content and Process for Value Education** • Understanding the need, basic guidelines, content and process for Value Education • Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration • Continuous Happiness and Prosperity- A look at basic Human Aspirations	6
2	**Understanding Harmony in the Human Being - Harmony in Myself!** • Understanding human being as a co-existence of the sentient 'I' and the material 'Body' • Understanding the needs of Self ('I') and 'Body' • Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I'	6
3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** • Understanding Harmony in the family – the basic unit of human interaction • Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tript; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship • Understanding the meaning of Vishwas; Difference between intention and competence • Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship • Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sahasttva as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family! • Practice Exercises and Case Studies will be taken up in Practice Sessions	5

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

CSE (AIML)

Unit No.	Contents	Max. Hrs.
4	**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence** • Understanding the harmony in the Nature • Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature • Understanding Existence as Co-existence (Sah-asttva) of mutually interacting units in all-pervasive space • Holistic perception of harmony at all levels of existence • Practice Exercises and Case Studies will be taken up in Practice Session	6

Text Books

SN	Title	Edition	Authors	Publisher
1	**The primary resource material for teaching this course consists of text book** A foundation course in Human Values and professional Ethics, Excel books,	1st Edition 2011	R.R Gaur, R Sangal, G P Bagaria	Excel books, New Delhi, 2010

Reference Books

SN	Title	Edition	Authors	Publisher
1	**The teacher's manual** A foundation course in Human Values and professional Ethics, Excel books,	1st Edition 2011	R.R Gaur, R Sangal, G P Bagaria	Excel books, New Delhi, 2010

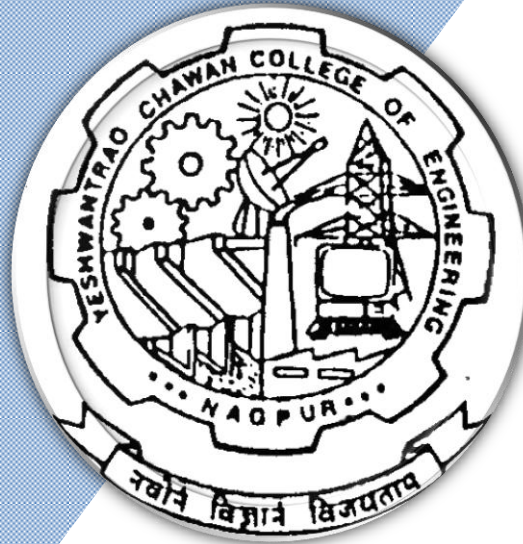|		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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 Technology
SoE & Syllabus 2021
2nd Semester

(Department of Computer Science & Engineering (CSE)Artificial Intelligence & Machine Learning

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					First Semester										
1	1	BS	GE	AIML2101	Calculus, Sequeces and Series	T	3	0	0	3	3	30	20	50	3 Hours
2	1	HS	GE	AIML2102	Technical Communication	T	3	0	0	3	3	30	20	50	3 Hours
3	1	HS	GE	AIML2103	**Lab:** Technical Communication	P	0	0	2	2	1		60	40	
4	2	BES	CSE	AIML2104	Computer Workshop	P	0	0	2	4	2		60	40	
5	1	BES	CSE	AIML2105	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hours
6	1	BES	CSE	AIML2106	Lab: Programming for Problem Solving	P	0	0	2	2	1		60	40	
7	1	BS	GE	AIML2107	Applied Chemistry	T	3	0	0	3	3	30	20	50	3 Hours
8	1	BS	GE	AIML2108	**Lab.:** Applied Chemistry	P	0	0	2	2	1		60	40	
					TOTAL FIRST SEM		12	0	8	22	17				

List of Audit Course

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
1	1	HS	GE	GE2131	Universal Human Value	T	2	0	0	0	0				
2	1	HS	GE	AU2121	YCCE Communication Aptitude Preparation (YCAP1)	A	3	0	0	3	0				
3	2	HS	GE	AU2122	YCCE Communication Aptitude Preparation (YCAP2)	A	3	0	0	3	0				

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Second Semester										
1	2	BS	GE	AIML2151	Probability and Statistics	T	3	0	0	3	3	30	20	50	3 Hours
2	2	BS	GE	AIML2152	Applied Physics	T	3	0	0	3	3	30	20	50	3 Hours
3	2	BS	GE	AIML2153	**Lab:** Applied Physics	P	0	0	2	2	1		60	40	
4	2	BES	EE	AIML2154	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
5	2	BES	EE	AIML2155	**Lab:** Digital Electronics	P	0	0	2	2	1		60	40	
6	2	BES	CSE	AIML2156	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	2	BES	CSE	AIML2157	**Lab:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	2	BES	CSE	AIML2158	Web Technology Lab	P	0	0	0	2	2		60	40	
9	2	HS	GE	AIML2159	Constitution of India	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL SECOND SEM		15	0	6	23	20				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

		June 2022	1.01	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2151 : Probability and Statistics

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1. This course provides an indication of the relevance and important of the probability theory in solving practical problems in the field of multidisciplinary engineering applications.	1. Identify an appropriate probability distribution for a given discrete or continuous random variable and compute probabilities.
2. To provide undergraduate foundation in both probability distributions and mathematical statistics relevant to engineering problems.	2. Make use of probability distributions to solve real life problems.
3. To teach mathematical skill sustained from this course to form a suitable base for analytical and theoretical concept encountered in engineering profession.	3. Apply concepts of sampling theory to find probabilities and estimates parameters of various problems.
	4. Inspect scientific data, use proper curve fitting and find correlation, regression of variables.

Unit No.	Contents	Max. Hrs.
1	**Random Variables & Probability Distributions** Conditional probability, Baye's theorem. Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions. Independent Random variables, Conditional Distribution.	7
2	**Mathematical Expectation** Mathematical Expectation, Variance & Standard Deviation, Moments, Moment generating function, Skewness and Kurtosis.	7
3	**Special Probability Distributions** Binomial, Geometric, Poisson, Exponential, Normal distributions, Central Limit theorem.	6
4	**Sampling Theory** Population and sample. Statistical inference. Sampling with and without replacement. Population parameters, sample statistics. Sampling distribution of means. Sampling distribution of proportions.	6
5	**Estimation** Unbiased and efficient estimates. Point estimates and interval estimates. Confidence interval for means, Confidence interval for proportions, Confidence interval for differences and sums of mean and proportions.	7
6	**Curve Fitting** Fitting of straight line, $y = a + bx$, a parabola $y = a + bx + cx^2$, exponential curves and power curves by method of least squares; Lines of regression and correlation; Rank correlation.	6

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

Text Books:

SN	Title	Edition	Authors	Publisher
1	The theory and problems of probability and Statistics	5rd edition	M. R. Spiegel	Schaum series. (McGraw Hill)
2	Basic Statistics for Business and economics	3rd edition	E. K.Bowen, M. K.Star	McGraw Hill
3	Engineering Mathematics	43rd edition	Dr. B. S. Grewal	Khanna Publisher
4	Probability and Statistics	2nd edition	Michael J. Evans and Jeffrey S. Rosenthal	

Reference Books:

SN	Title	Edition	Authors	Publisher
1	A First course in probability	Sixth Edition	Sheldon Ross	Pearson Education
2	Fundamentals of Mathematical statistics	3rd Edition	S. C.Gupta and V.K.Kapoor	Sultan Chand and Sons
3	Probability and Statistics for Engineering	6th edition	Miller Freund and Johnson.	Richard A. Johnson

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-AIML-2

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2152 : Applied Physics

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To know the fundamental principles of Applied engineering physics specifically concern to quantum physics, crystal structure, band theory of solids, Laser, Optical fibre, electron ballistics, electron optic devices and their engineering applications. 2) To provide problem solving experience and learning of concepts through it in Applied engineering physics, in both, the classroom and the laboratory learning environment	1) Co-relate fundamentals of quantum mechanics to solve problems dealing with quantum particle. 2) Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands. 3) Illustrate working principle of lasers and optical fibres for their use in the field of industry. 4) Identify the requirements of sensor material for technological application. 5) Analyze the motion in electric field and magnetic field and its applications to electron optic devices.

Unit	Content	Hours
1	**QUANTUM PHYSICS** Wave-particle duality, Electron Diffraction, Wave packet, Heisenberg uncertainty principle, thought experiment, Significance, Applications.	6
2	**BASICS OF QUANTUM COMPUTING** Introduction of complex numbers, operators, eigen values, eigen functions. Wave function and itsprobability interpretation, Schrodinger Equation, Particle in infinite and finite potential well, quantum tunneling, Introduction to Bits and Qubits.	7
3	**BAND THEORY OF SOLIDS** Formation of energy bands in solids, Classification and energy band diagrams, Structure of semiconductor with band diagram, Intrinsic and extrinsic semiconductors,Law of mass action, Carrier transport, conductivity, Hall Effect.	7
4	**OPTICAL RADIATIONS & COMMUNICATION** Interaction of radiation with matter, Population Inversion and Optical resonance cavity, diode laser, Properties and engineering applications of laser. Optical Fibre: Principle, structure and classification, Acceptance angle, Numerical aperture, Losses**.**	7

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

Unit	Content	Hours
5	**SENSORS** Introduction, classification of sensors, performance characteristics, selection criteria, Requirement of sensor material, Role of sensors in industry, Examples: thermal, optical, pressure and acoustic sensors.	6
6	**ELECTRON BALLISTICS AND OPTICS** Motion of a charged particle in uniform electric and magnetic field, Cross field configuration; Electron refraction, Electron lens, CRO.	7

Text Books

SN	Title	Edition	Authors	Publisher
1	A Textbook of Engg. Physics	Revised	M.N.Avadhanulu , P.G.Kshirsagar	S.Chand and Company
2	Electronic Engineering Materials and Devices	TMH edition, 10th	John Allision	reprint Tata McGraw Hill

Reference Books

SN	Title	Edition	Authors	Publisher
1	Fundamentals of Physics	10th	David Halliday, Robert Resnick and Jerle Walker,	John-Wiley India John Wiley & Sons Inc
2	Text Book of Optics	Revised	Brijlal and Subramanyam	S. Chand and Company
3	Laser	2 nd	M. N. Avadhanulu	S. Chand and Company
4	Concept of Modern Physics	6th	A.Beiser	Tata McGraw-Hill
5	LASERS: Theory and Applications:.	2nd	Thyagarajan K and Ghatak	A.K Macmillan Publication
6	Solid state Physics	9th	S.O.Pillai	New Edge International Publishers
7	Solid State Physics	8th	Palanisamy	SciTech Publishers
8	Solid State Physics	8th	C. Kittel	Willey Publication
9	Engineering Physics	1st	B.K.Pandey,S.Chaturvedi	Cengage Learning
10	Engineering Physics	2nd	H.K.Malik, A.K.Singh	Tata McGraw-Hill

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2153 : Lab.: Applied Physics

Course Outcome
On completion of this course, the student will be able to
CO2- Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands.
CO3- Illustrate working principle of lasers and its properties for useful applications in the field of industry.
CO4-Identify the requirements of sensor material for technological application.
CO5-Analyze the motion in electric field and magnetic field and its applications to electron optic devices.

List of Practical's

Expt.	Name of Experiment	CO	PO
1	Determination of Hall coefficient and density of charge carriers using Hall effect.	CO2	PO1,PO2
2	Determination of amplitude and frequency of sinusoidal signal using C.R.O.	CO 5	PO1,PO2
3	The study of V-I characteristics of a semiconductor diode (germanium and silicon) in forward and reverse bias mode.	CO 2	PO1,PO2
4	Determination of Band gap in a semiconductor by four probe method.	CO 2	PO1,PO2
5	To measure the phase shift introduced by a phase shift network using Dual beam CRO.	CO 5	PO1,PO2
6	Determination of wavelength of laser using diffraction grating.	CO 3	PO1,PO2
7	Determination of Band gap in a semiconductor using reverse biased p-n diode .	CO 2	PO1,PO2
8	Determination of divergence of laser beam.	CO 3	PO1,PO2
9	Determination of Acceptance angle and numerical aperture of a given optical fiber	CO 4	PO1,PO2
10	Dependence of Hall coefficient on temperature.	CO 2	PO1,PO2
11	Determination of attenuation of a given optical fibre.	CO 4	PO1,PO2
12	Study of magnetic field sensing by varying the gap between pole pieces of electromagnet.	CO 4	PO1,PO2
13	Determination of the velocity of Ultrasonic waves in a non –electrolytic liquid by ultrasonic interferometer	CO 4	PO1,PO2
Demonstration Experiment			
14	Determination of the velocity of Ultrasonic waves in a non –electrolytic liquid by ultrasonic interferometer		

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2154 : Digital Electronics

Objective	Course Outcome
➢ Develop a strong foundation of digitalelectronics. ➢ Understand concepts of combinational andsequential circuits. ➢ Analyze the synchronous and asynchronouslogic circuits.	Students will be able to: 1) Simplify combination logic circuits using Boolean algebra. 2) Understand and demonstrate the various codes and illustrate their addition substraction. 3) Simply and exhibit the methods to solve logical functions using K- map and Quine Mc-Cluskey methods and apply it to implement combinational logic circuits. 4) Design and analyze Synchronous and Asynchronous sequentialCircuits.

Unit No.	Contents	Max. Hrs.
1	Number system and codes :Binary: octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), gray code, excess–3 code, ASCII codes. Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation.	6
2	Boolean Algebra: Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR and their truth tables,), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem. Introduction to Logic Family.	6
3	Minimization Techniques: Min term, Max term, POS, SOP, K-Map, Simplification by Boolean theorems, don't care condition.	6
4	Combinational Logic: The Half adder, the full adder, subtractor circuit. Multiplxer de-multiplexer, decorder, BCD to seven segment Decorder, encoders	6
5	Sequential Circuits: Flip flop, set-reset laches, R-S flip-flop, D-flip flop, J-K Flip-flop, Master slave Flip flop, T flip-flop, excitation table of flip-flops.	7
6	Registers & Counters: Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register, Synchronous/Asynchronous counter, Structure of RAM.	7

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

TEXT BOOKS

1. Modern Digital Electronics , RP Jain, Tata McGraw Hill, 3rd Edition
2. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 PearsonEducation (Singapore) Pvt. Ltd., New Delhi, 2003.
3. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6thEdition,TMH, 2003.
4. Anandkumar- fundamental of digital circuit. 3rd edition. PHI

Reference Books:

1) Fundamentals of Logic Design, C.H.Roth, Public Work & Services, 3rd edition 2007.
2) Engg Approach to Digital Design, Fletcher, Prentice Hall of India 1993.
3) Digital Circuits & Microprocessors, Hebert Taub, Mc Graw Hill, 1988.

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-AIML-7

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2155 : Lab: Digital Electronics

Objective	Course Outcome
- Develop a strong foundation of digital Electronics. - Understand concepts of combinational and sequential circuits. - Design and develop combinational and sequential circuits	Students will be able to: 1. Simplify combination logic circuits using Boolean algebra and exhibit the methods to solve logical functions using K-map and Quine-Mc-Clauskey methods. 2. Understand and apply the concept of combinational logic circuits in various digital systems. 3. Understand and demonstrate the various codes and illustrate concept of logic family with their characteristics. 4. Understand the working of Flip-flops and its use to design Synchronous counters and Design and demonstrate finite state machines.

List of Practical's

Sr. No..	Problem Statements
1.	Introduction to LogicAid software and commands. Verifications of functions using Logic Aid and comparing the results with manual results.
2.	Introduction to Bread Board and Verify Truth Tables of basic Logic gates using Bread Board.
	On Experimental Kit (Hardware) / Virtual Lab: **An Initiative of Ministry of Human Resource Development Under the National Mission on Education through ICT**
3.	Construction of half/ full adder using XOR and NAND gates and verification of its operation.
4.	Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
5.	Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
6.	Verify the truth table of D-flip-flops and JK- flip-flops.
7	Design and verify the 2- Bit Synchronous up Counter.
	Using SPICE
8	Introduction to SPICE Digital model and commands. Verify Truth Tables of basic Logic gates & Universal Gates **using SPICE.**
9	Design & verify Truth Table of Half adder & Full adder circuits **using SPICE.**
10	Design & verify Truth Table of 4:1 Multiplexer & 1: 4 Demultiplexer circuits **using SPICE.**

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2156 : Object Oriented Programming

Objective	Course Outcome
The student should be able to 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	**On completion of this course, the student 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 small programs using classes 5. Design, develop, test, and debug programs using object oriented principles of java

Unit No.	Contents	Max. Hrs.
1	Introduction to object oriented programming paradigm, procedure oriented programming vs OOP, features of OOP, benefits of OOP, defining class, instantiating a class. Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control	8
2	Other Class Modifiers: static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances)	7
3	Arrays, Strings Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes,	8
4	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
5	Collection Vector and Framework: Introduction to collection framework, Vectors, Array List, Linked list, Hashset, Treeset, Hashmap	7
6	IO Steam, applets and Thread: Introduction to stream classes, use of stream classes,I/O stream, bytes stream, character stream, predefined 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 life cycle, creating and executing applets, Introduction to multithreading, life cycle of Thread, Runnable interface and Thread class.	8

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

Text Books

SN	Title	Edition	Authors	Publisher
1	Thinking in Java	4th	Bruce Eckel	Prentice Hall

Reference Books

SN	Title	Edition	Authors	Publisher
1	Java Complete Reference	7th	Herbert Schildt	McGraw-Hill
2	Programming with Java	6th	E. Balagurusamy	TATA McGraw-Hill

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-AIML-10

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2157 : Lab.: Object Oriented Programming

List of Practical's

Sr. No..	Problem Statements
1	Implement the concept of Class and its data members and member functions in Java
2	Implement the concept of function overloading in Java
3	Implement the concept of class constructor and its type in Java
4	Implement the concept of Abstraction in Java
5	Implement the concept of all types of inheritance in Java
6	Implement the collection listener to solve the problem in Java
7	Implement the concept of run time polymorphism in Java
8	Implement the concept of Files using command line arguments in Java
9	Implement the concept of exception in Java
10	Implement the concept of applet to prepare a web application in Java

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-AIML-11

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2158 : Web Technology Lab

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To introduce with the internet technology	1) Understand various internet technologies
2) To study the basic of web page designing	2) To design the web pages using some basic techniques
3) To introduce the validations in the web page	3) To design and implement the interactive web pages
4) To introduce the concepts of data storage using XML	4) To use the XML technology to store the data
5) To learn the advance technique for designing the interactive web page	5) To design and develop the interactive web pages using the advanced technique

List of Practical's

Sr.No.	Problem Statements
1	Introduction to internet (Overview of Internet, Email, WWW, Broad Band and FTP)
2	Study and implement basic HTML Tags.
3	Create web forms by using form tags in HTML. (Use any example)
4	Program to demonstrate the use of java Script in while and for loops.
5	Program to demonstrate the use of java Script in conditional statements and functions.
6	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
7	Introduction to XML program to demonstrate the use of External and Internal DTD.
8	Create a web form which will accept two numbers as input and perform operation depending on value selected from dropdown list control.
9	To create a web form to demonstrate the use of ASP.NET Web controls- Radio Button Control, Image Control and Link Button Control

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
Artificial Intelligence & Machine Learning (AIML)

II Semester
AIML2159 : Constitution of India

Objective	Course Outcome
The student should be able to	**On completion of this course, the student will be able to**
1) To enable the student understand the importance of constitution	1) Explain the basic concepts of Constitution of India.
2) To understand the structure of executive, legislature and judiciary	2) Describe the various Fundamental rights
3) To analyze federalism in the Indian context	3) Analyze the Impact of federalism on the State
4) To understand philosophy of fundamental rights and duties	4) Explain Industrial Law and Judiciary.
5) To understand and evaluate the Indian Political scenario of the emerging challenges.	

Unit No.	Contents	Max. Hrs.
1	**Origin and Meaning** Origin of history of Constitution, Meaning of the constitution law and constitutionalism, Kingship and Republic States in Ancient India	6
2	**Concept of the Constitution of India** Preamble, The union and its territory, Citizenship	6
3	**Federalism** Salient features of Federalism, Structures and features of Indian Federalism, Panchayat Raj System	6
4	**Fundamental Rights** Scheme of the Fundamental rights, duties, Scheme of the Fundamental Right to Equality, The scheme of the Fundamental Duties and its legal status	7

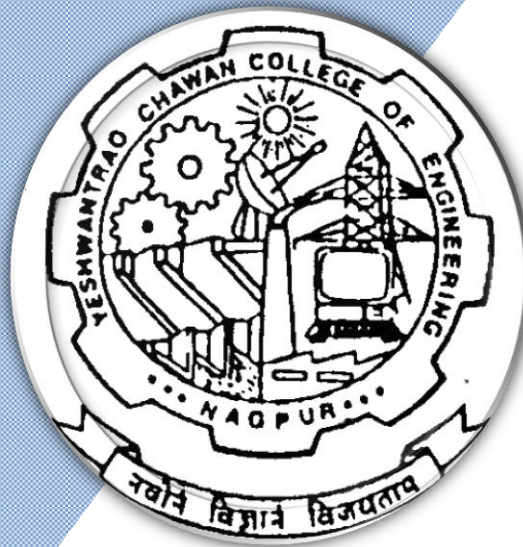|		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-AIML-13

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)

Artificial Intelligence & Machine Learning (AIML)

Unit No.	Contents	Max. Hrs.
5	**Legislative Power** Federal structure and distribution of legislative, Financial power between the Union and the States, Parliamentary Form of Government in India – The constitution power and status of the President of India	7
6	**Challenges to Indian Political Systems** The Executive, Directive principles of State Policy, The Union Judiciary	7

Text Books

SN	Title	Edition	Authors	Publisher
1	"Social Science"	1st Edition	Dr G.N. Nimbarte, (2018)	Sankalp Publication, Vidhya Nagar, Nagpur

Sn	Title	Edition	Authors	Publisher
1	Constitution of India	1st Edition	Dr. B. R. Ambedkar	Government of India, Ministry of Law and Justice
2	An Introduction to the Constitution of India	24th Edition	Basu, D.D (2005)	New Delhi, Prentice Hall
3	Working of a Democratic Constitution of India	2nd Edition	G. Austin (2004)	New Delhi: Oxford University Press.
4	State and Government in Ancient India	7th Edition	A.S. Altekar (2016)	Motilal Banarsidass Publishing House, New Delhi.
5	Understanding Contemporary India: Critical Perspectives,	1st Edition	A. Vanaik and R. Bharghava (eds) (2010)	New Delhi: Orient Blackswan.

		June 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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 Technology

SoE & Syllabus 2021

3rd Semester

(Department of Computer Science & Engineering (CSE)Artificial Intelligence & Machine Learning

B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Third Semester										
1	3	BS		AIML2201	Distrete Mathematics and Graph theory	T	3	0	0	3	3	30	20	50	3 Hours
2	3	PC	CSE	AIML2202	Formal Language & Automata Theory	T	3	0	0	3	3	30	20	50	3 Hours
3	3	PC	CSE	AIML2203	**Lab:** Formal Language & Automata Theory	P	0	0	2	2	1		60	40	
4	3	PC	CSE	AIML2204	Data Structures	T	3	0	0	3	3	30	20	50	3 Hours
5	3	PC	CSE	AIML2205	**Lab:** Data Structures	P	0	0	2	2	1		60	40	
6	3	PC	CSE	AIML2206	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	CSE	AIML2207	**Lab:** Software	P	0	0	2	2	2		60	40	
					TOTAL THIRD SEM		12	0	6	18	16				

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Fourth Semester										
1	4	BS	GE	AIML2251	Linear Algebra	T	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	CSE	AIML2252	Operating Systems	T	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	AIML2253	**Lab:** Operating Systems	P	0	0	2	2	1		60	40	
4	4	PC	CSE	AIML2254	Software Engineering	T	3	0	0	3	3	30	20	50	3 Hours
5	4	PC	CSE	AIML2255	**Lab:** Software Engineering	P	0	0	2	2	1		60	40	
6	4	PC	CSE	AIML2256	Design & Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3 Hours
7	4	PC	CSE	AIML2257	**Lab:** Design & Analysis of Algorithms	P	0	0	2	2	1		60	40	
8	4	PC	CSE	AIML2258	Database Management Systems	T	3	0	0	3	3	30	20	50	3 Hours
9	4	PC	CSE	AIML2259	**Lab:** Database Management Systems	P	0	0	2	2	1		60	40	
					TOTAL FOURTH SEM		15	0	8	23	19				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

List of Audit Course

1	3	HS		GE2121	Env Studies for EL,ETC,CT,CSE-AIML	T	2	0	0	2	0				
2	3	HS		AU2123	YCCE Communication Aptitude Preparation (YCAP3)	A	3	0	0	3	0				
3	4	HS		AU2124	YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE, IIoT, AIML, CSD, AIDS	A	3	0	0	3	0				

		June 2022	1.01	Applicable for AY 2022-23 Onwards
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2201 - Discrete Mathematics and Graph theory

Objective	Course Outcome
1. This course will provide the mathematical fundamentals needed to understand computer application. 2. To provide the mathematical concepts necessary in the study of propositional and predicate logic. 3. To discuss the concepts of algebraic systems like semi groups and groups. 4. To use graph theory to analyze the complex structure which helps in writing efficient code.	With the completion of this syllabus students will be able to 1. Identify the importance of statements in deriving valid inferences. 2. Use relations and ordering methods to identify the relationship among the inferences. 3. Select suitable algebraic systems to find solution for real time problems. 4. Find the suitable computing methods and applying graph theory concepts to solve complex problems

Unit No.	Contents	Max. Hrs.
1	**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.	6
2	**Relations and Functions:** Relations and Ordering, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial order relation, Partially Ordered sets, Functions , Composition of functions, Inverse Functions, Characteristics function of a set.	6
3	**Group Theory:** Groups, Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups. Semi groups and Monoids Homomorphism of semigroups and monoids, Sub semi groups and monoids.	7
4	**Rings:** Definitions and Examples, sub ring, Integral domain, ring homomorphism, ideal of ring polynomial.	7

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

5	**Field and Lattices :** Definitions and Examples, Finite Field, Ordered sets, Hasse Diagrams of partially Ordered sets. Lattices, Bounded Latices, Complements Latices, Definitions and Examples of Finite Field, Ordered sets, Hasse Diagrams of partially Ordered sets. Lattices, Bounded Latices, Complements Latices.	7
6	**Graph Theory:** Basic concepts of graph theory, Basic definitions, Paths and circuits, Reachability and connectedness, Matrix Representation of graphs, Tree and their representation and operations, Rooted trees, Path lengths in rooted trees, Multi graphs and weighted graphs, and graph isomorphism, shortest paths in weighted graphs, Hypergraphs, transitive closure, Spanning trees, Kruskal's algorithm, Prim's algorithm.	7

Text Books:

SNo	Title	Edition	Authors	Publisher
1	Discrete Mathematics Structure with application to Computer Science	1st edition	J. P. Tremblay & R. Manohar	Tata McGraw-Hills Publication Company Limited
2	Discrete Mathematics	2nd edition	Lipschutz Schaums	Tata McGraw-Hills Publication Company Limited

Reference Books:

SNo	Title	Edition	Authors	Publisher
1	Mathematical structures	3rd edition	Kolman ,Robert C.Busby, Sharon Ross	Prentice Hall of India

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2202 - Formal Language & Automata Theory

Objectives	Outcomes
1. To understand the basic properties of formal languages and Finite Automata, regular expression and Regular Grammar.	1. Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar.
2. To study of different types of grammars and the properties of Context Free Grammar	2. Construct context free grammar for various languages.
3. To understand the basic properties of CFL and Designing of Push Down Automata	3. Solve various problems of push down automata for context free language
4. To understand the basic properties of Turing machine and study of Recursive Language, decidability, post Correspondence problem and Recursive enumerable language.	4. Design Turing Machines for given any computational problem.

Unit No.	Contents	Max. Hrs.
1	Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Design of Finite State Machines, Acceptance of strings and languages, Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA, NFA with ε-transition, Minimization of FA.	8
2	Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets (Proofs not required), Regular grammars, Right linear and left linear regular grammars, inter-conversion between LLG & RLG, Equivalence between regular grammar and F.A., Inter-conversion between RE and RG.	7
3	Context free grammar, Derivation trees (Syntax tree and Parse tree), Ambiguous Grammar, Context Free Language (CFL), Normal Form of grammar: Chomsky Normal form, Greibach normal form.	7
4	Push down automata, definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Inter-conversion, Closure properties of CFL, DPDA & NDPDA.	6
5	Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive Language, Recursive enumerable language, , Properties of Recursive enumerable language, Church's hypothesis, Chomsky hierarchy of language, Linear bounded automata , context sensitive language, Universal Turing Machine	6
6	Un-decidability Problems related to Recursive enumerable language and Turing Machine, post correspondence problem. Recursive function Theory –Basis functions and operations on them. Bounded minimization preemptive μ recursive function ,unbounded minimization and recursive function	6

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Text Books:

SNo	Title	Edition	Authors	Publisher
1	Introduction to Automata Theory, Languages, and computation	3rd Edition	Hopcroft J.E., Rajeev Motwani, Jeffrey D. Ullman	Pearson Education
2	Introduction to languages and the Theory of Computation	3rd Edition	John C.Martin	Mc Graw Hill

Reference Books:

SNo	Title	Edition	Authors	Publisher
1	Introduction to the Theory of Computation	2nd Edition	Michael Sipser	GALE CENGAGE Learning
2	Theory of Computation	1st Edition	Dr. O. G. Kakde	Laxmi Publication

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-4

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2203 - Lab: Formal Language & Automata Theory

Sr. No.	List of Experiment
1	Study of JFLAP tool.
2	Study of other FLAT tools.
3	Design NFA for a string starting with '0' over the alphabet Σ = {0,1} using JFLAP.
4	Using JFLAP, construct NFA for a string ending with 'b' over the alphabet Σ = {a,b}.
5	Construct a DFA for a string containing '00' over the alphabet Σ = {0,1} using any tool.
6	Construct a DFA for a string having second last symbol as 'a' over the alphabet Σ = {a,b} using JFLAP.
7	Build a PDA for a palindrome of even length over the alphabet Σ = {0, 1}.
8	Build a PDA for a palindrome of odd length over the alphabet Σ = {a, b}.
9	Enter the following CFG into JFLAP S → T T S → U T → 0T T → T0 T → # U → 0U00 U → #
10	Design a Turing Machine that concatenates the following strings on the input tape '...□001□110□100□'.

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-5

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2204: Data Structures

Objective	Course Outcome
1. To make students familiar with arrays, operations on arrays and structures 2. To make student understand concept of abstract data types like stacks and queues, linked list 3. To make student understand trees and graphs and operations on it 4. To create thinking ability needed for implementation of programming logic with proper use of memory	1. To understand fundamental concepts in data structures 2. To apply and analyse algorithms for performing operations on data structures 3. To evaluate the performance of data structures and its applications. 4. Simulate the algorithms for performing operations on data structures.

Unit No.	Contents	Max. Hrs.
1	Introduction to data structures- Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort , Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search, Hashing: Direct-address tables, Hash tables, open addressing, Perfect Hashing	7
2	Stacks and queues: The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues	6
3	Linked Lists: Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation, multi-precision arithmetic.	6
4	Binary Trees: Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs. Heaps and heap sort	6
5	Balanced trees: Height-balanced (AVL) trees, Splay tree, Red-black trees, Multi-way trees-B and B+ and applications	6
6	Graphs: Representation & traversals: Spanning trees, topological sort, shortest path algorithm, all-pairs shortest paths	7

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Text books:

Sr. No	Title	Authors	Edition (Year of Publication)	Publisher
1	Data Structures & Program Design in C	Robert Kruse, G. L. Tondo and B. Leung	latest edition	Person
2	"Fundamentals of Data Structures in C",	Horowitz, S. Sahni, S. Anderson-freed,	latest edition	University Press,
3	"Data Structures Using C and C++"	Y. Langsam, M. J. Augenstein and A. M. Tannenbaum,	latest edition	Prentice Hall India,

Reference books:

Sr. No	Title	Authors	Edition (Year of Publication)	Publisher
1	Fundamentals of Data Structures in C++	2nd, 2009	Ellis Horowitz, Sartaj Sahani, Dinesh Mehta	University Press
2	Data Structures with C	Latest	Seymour Lipschutz	Tata McGraw Hill

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2205 - Lab: Data Structures

Sr. No.	List of Experiment
1	Program based on searching- linear , binary search
2	Program based on sorting- quick sort / merge sort
3	Program based on stacks creation and operations on it
4	Program based on queue creation and operations on it
5	Program based on single linked list creation and operations on it
6	Program based on double linked list creation and operations on it
7	Program based on Binary tree : creation and traversal
8	Program based on Binary search tree : creation and searching
9	Program based on graphs :creation and traversal
10	Program based on graph: Prims/ Kruskal algorithm for finding minimum cost spanning tree

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-8

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2206: Computer Architecture and Organisation

Objective	Course Outcome
1. Understand basics of computer architecture, its components with peripheral devices, instruction set architecture 2. To introduce essentials of assembly language programming. 3. To introduce the students to inner working of CPU and its design based on hardwired and microprogrammed control unit 4. To deliver the knowledge of information representation within computers memory, and to know the hardware implementations of arithmetic operations on integers and floating point numbers 5. To study the function of each element of a memory hierarchy in view of its effects on overall system performance. 6. Learn the concepts of interrupts, I/o modules, DMA, and pipelining	On completion of the course, student will be able to 1. Understand and demonstrate the basic computer architecture concepts related to the working of processors, memory systems, and input output systems. 2. Differentiate among various addressing modes and develop ability to write assembly language programs. 3. Comprehend information representation in computer and perform arithmetic operations using algorithms suitable for hardware implementation. 4. Explain and compare techniques for improving the performance of a computer system components like CPU, main memory, input/output system and pipelining.

Unit No.	Contents	Max. Hrs.
1	Basic Structure of Computer Hardware and Software: Functional Units, Basic Operational Concepts, Bus Structures, Software, processor clock and basic performance evaluation, number systems, and arithmetic operations, Memory Locations, addressing and encoding of information, instruction and instruction sequencing, branching, condition codes, zero, one and two address instructions, RISC vs CISC computers.	6
2	Addressing modes, Stacks, and Subroutines, Processing Unit: Some fundamental concepts, Execution of a complete instruction, One, two, and three bus organization, Sequencing of control Signals, Assembly language programming.	6
3	Processor Design, hardwired control, Microprogrammed Control: Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, prefetching microinstructions.	7

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

4	Arithmetic (Fixed and Floating point): 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, Booth's Algorithm , fast Multiplication, Integer Division algorithms, Floating point numbers and operations, IEEE floating point standards	7
5	The Main Memory: Basic concepts, Memory Hierarchy, semiconductor RAM memories, Static RAM vs Dynamic RAM, semiconductor ROM memories, DDRAM, Memory system considerations, Speed , Size and Cost. Cache Memory: cache memory mapping techniques, secondary storage devices, HDD vs SSD, Performance Considerations.	6
6	Computer Peripherals, I/O modules and I/O Devices, I/O transfers: program controlled, memory mapped and I/o mapped I/O, Interrupt handling and Interrupt driven I/O, DMA. Pipelining: Basic Concepts, Data Hazards and Instruction Hazards. Introduction to GPU and GPU Computing.	6

Text Books

SN	Title	Edition	Authors	Publisher
1	Computer Organization	5th edition	V. Carl Hamacher, ZvonkoVranesic,	McGraw Hill Publications.
2	Computer Architecture: A Quantitative approach	6th edition	John L. Hennessy, David A. Patterson	MK series in computer architecture and design

	Reference Books			
SN	Title	Edition	Authors	Publisher
1	Computer Organization and Architecture	6th edition	WillaiamStaliing	Pearson Education
2	Computer Architecture & Organization	3rd edition	J.P. Hayes	McGraw Hill Publications

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

YCCE-CSE- AIML-10

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

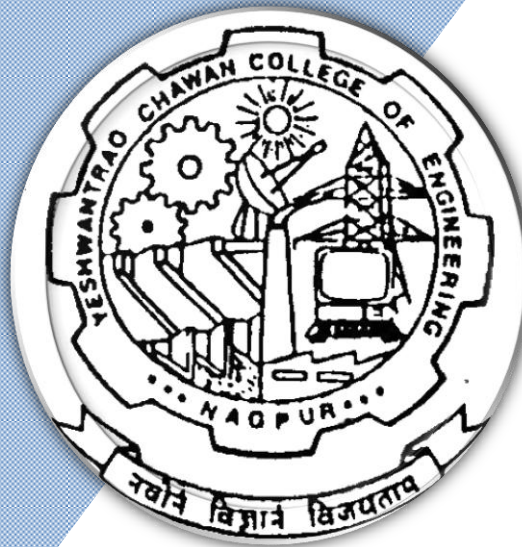(Scheme of Examination w.e.f. 2021-22 onward)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

III Semester
AIML2207 - Lab: Software

Objective	Course Outcome
- Understanding data types, data structures, control and Loop statements in Python. - Learn def function definitions, and modules. - Learn basic object-oriented concepts using Python. - 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. understand the concepts of functions, modules and packages and write complex programs using them. 3. understand defining and handling Python objects and develop classes required for the given application 4. develop a useful application in Python.

Unit No.	Contents	Max. Hrs.
1	Introduction: Build-in Data types: Data type & Variables,, 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, statements, Loop statements: For, while, continue and break, try and except statement, raise, with statements.	4
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.	3
3	Python Object and Classes: defining classes and creating classes, member variables, Doc strings for classes, Private members, Python Operator Overloading, Python inheritance and polymorphism, Exception Handling, Python Modules and packages.	2
4	Developing applications in Python using built in and customized modules and packages.	1

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Books:

Sr. No	Title	Authors	Edition (Year of Publication)	Publisher
1.	Learn Python Programming	Fabrizio Romano, Heinrich Kruger	Third Edition, 2020	PACKT Publishing
2.	Introduction to Computation and Programming Using Python	John V. Guttag	Second Edition,2016	PHI EEE(MIT Press)

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-12

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 Technology
SoE & Syllabus 2021
4th Semester

(Department of Computer Science & Engineering
(CSE)Artificial Intelligence & Machine Learning

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Third Semester										
1	3	BS		AIML2201	Distrete Mathematics and Graph theory	T	3	0	0	3	3	30	20	50	3 Hours
2	3	PC	CSE	AIML2202	Formal Language & Automata Theory	T	3	0	0	3	3	30	20	50	3 Hours
3	3	PC	CSE	AIML2203	**Lab:** Formal Language & Automata Theory	P	0	0	2	2	1		60	40	
4	3	PC	CSE	AIML2204	Data Structures	T	3	0	0	3	3	30	20	50	3 Hours
5	3	PC	CSE	AIML2205	**Lab:** Data Structures	P	0	0	2	2	1		60	40	
6	3	PC	CSE	AIML2206	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	CSE	AIML2207	**Lab:** Software	P	0	0	2	2	2		60	40	
					TOTAL THIRD SEM		12	0	6	18	16				

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
					Fourth Semester										
1	4	BS	GE	AIML2251	Linear Algebra	T	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	CSE	AIML2252	Operating Systems	T	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	AIML2253	**Lab:** Operating Systems	P	0	0	2	2	1		60	40	
4	4	PC	CSE	AIML2254	Software Engineering	T	3	0	0	3	3	30	20	50	3 Hours
5	4	PC	CSE	AIML2255	**Lab:** Software Engineering	P	0	0	2	2	1		60	40	
6	4	PC	CSE	AIML2256	Design & Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3 Hours
7	4	PC	CSE	AIML2257	**Lab:** Design & Analysis of Algorithms	P	0	0	2	2	1		60	40	
8	4	PC	CSE	AIML2258	Database Management Systems	T	3	0	0	3	3	30	20	50	3 Hours
9	4	PC	CSE	AIML2259	**Lab:** Database Management Systems	P	0	0	2	2	1		60	40	
					TOTAL FOURTH SEM		15	0	8	23	19				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

List of Audit Course

1	3	HS		GE2121	Env Studies for EL,ETC,CT,CSE-AIML	T	2	0	0	2	0				
2	3	HS		AU2123	YCCE Communication Aptitude Preparation (YCAP3)	A	3	0	0	3	0				
3	4	HS		AU2124	YCCE Communication Aptitude Preparation (YCAP4.1) for CV,ME,CT,IT,CSE, IIoT, AIML, CSD, AIDS	A	3	0	0	3	0				

		June 2022	1.01	
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	**Applicable for AY 2022-23 Onwards**

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2251 – Linear Algebra

Objective	Course Outcome
1. To provide mathematical knowledge required to analyze problems encountered in engineering. 2. The students are acquainted with the solution of system of linear equation, eigen values and eigen vectors. 3. To apply principles of matrix algebra to linear transformations and inner products. 4. Student can apply this course in many areas of engineering such as computer graphics, cryptography, wire-less communication, signal processing, robotics and animation.	After completion of the course, the student will be able to 1. Solve systems of linear equations using rank of matrix 2. Determine eigenvalues and eigenvectors and solve eigenvalue problems. 3. Explain the concepts of vector space and subspace, span and basis. 4. Apply principles of matrix algebra to linear transformations and inner product.

Unit No.	Contents	Max. Hrs.
1	**Elementary matrix operations** Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.	6
2	**Matrix Algebra** Rank of a matrix, Gaussian elimination, LU Decomposition (Crout's method), Solving Systems of Linear Equations using the tools of Matrices.	6
3	**Diagonalization of matrix** Eigen Values and Eigen vectors, Linear dependence and independence of Eigen Vectors, Orthogonal Eigen vector, Diagonalization of matrix, Cayley-Hamilton Theorem and Sylvester's Theorem.	7
4	**Vector Space** Vector Space, Subspace, Sum of Sub space, linear combination, Linear dependence and independence, Span and basis, Spanning sets, Generators.	6
5	**Linear Transformation** Linear transformation, Ranges and Kernel (null space) of linear transformation, Inverse of linear transformation, Algebra of linear transformation, Singular and nonsingular linear transformation.	7

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

	Inner product Spaces	
6	Inner product space and Norms, orthogonal vector, the Gram Schamidt orthogonalization Process , orthogonal compliment, Adjoint of Linear operator, Normal and self adjoint operator, Unitary and orthogonal operator, Bilinear and Quadratic form.	7

Text Books

SN	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
4	Linear Algebra,		Hoffman and Kunze	prentice Hall of India, New Delhi
5	Linear Algebra and its Applications		GlbertStrang	Nelson Engineering (2007)

Reference Books

SN	Title	Edition	Authors	Publisher
1	Mathematics for Engineers	19th edition, (2007)	Chandrika Prasad.	JohnWiley & Sons
2	Advanced Mathematics for Engineers	4th edition, (2006)	Chandrika Prasad	JohnWiley & Sons
3	Applied Mathematics for Engineers	3rd edition, (1970)	L.A. Pipes and Harville	McGraw Hill
4	Matrix and Linear Algebra,	Latest edition	K.B.Datta:	prentice Hall of India, New Delhi
5	A text book of Engineering Mathematics	Reprint 2008	N.P. Bali and Manish Goyal	LaxmiPrakashan

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2252– Operating Systems

Objective	Course Outcome
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 student 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, process concept, process state transitions , Services provided by OS, system calls, privileged instructions, Dual mode of operation, I/O bound and CPU bound processes, concept of multiprogramming and multiprocessing.	5
2	Process management: process control block, process context switch, process versus threads, CPU scheduling, goals of scheduling, CPU scheduling algorithms, Algorithmic evaluation of CPU scheduling algorithms, multi-queue scheduling, multithreading	6
3	Interprocess communication and Synchronization: Operations on processes, Interprocess communication, process cooperation and synchronization, race condition, critical region, mutual exclusion and implementation, semaphores, classic problems of Synchronization using semaphores, other synchronization constructs.	8
4	Memory management techniques: -contiguous allocation, static and dynamic partitioning, non-contiguous allocation, paging, translation look aside buffer (TLB) and overheads, segmentation.	6
5	Virtual memory: demand paging, page replacement algorithms, thrashing, and working set model. Deadlocks: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock.	7
6	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.	6

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Text Books

SN	Title	Edition	Authors	Publisher
1	Operating system Principles	9th Edition	A. Silberchatz and P.Galvin	John Wiley & Sons Inc.
2	Operating Systems Internals and Design Principles	2nd	William Staling	Pearson

Reference Books

SN	Title	Edition	Authors	Publisher
1	Operating Systems: A Design-Oriented Approach	-	Charles Crowley	McGraw Hill
2	Operating system concepts and Design	2nd	Milan MilenKovic	Tata McGraw Hill

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-4

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech SoE and Syllabus 2021-22
(Scheme of Examination w.e.f. 2021-22 onward)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2253–Lab: Operating Systems

Sr. No.	List of Experiment
1	Study of Window task manger(Exploring various tabs: application, processes, services, networking, performance)
2	Study of Advanced Linux shell commands (Process management, memory management, networking, 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: a) Any preemptive CPU Scheduling Algorithm b) Any Non-preemptive CPU Scheduling Algorithm
6	Write a program to perform Inter-Process-Communication using shared memory or, pipes or message queues.
7	Write a program that solves two process Producer-Consumer problem with bounded buffer using semaphores. OR Write a program that gives a deadlock and starvation free solution to the Dining Philosohers problem using semaphores.
8	Simulate: a) First Fit(Static Memory allocation algorithm) and b) Worst Fit(Dynamic Memory allocation algorithm)
9	Simulate any one of the following page replacement algorithms: FIFO, LRU, Optimal
10	Write a program to simulate Banker's Deadlock avoidance algorithm.

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-5

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2254– Software Engineering

Objective	Course Outcome
1. Study software engineering best practices and different strategies applicable for software development, software requirement and its design activity. 2. Explore the various testing types and it strategies. 3. Understand configuration management, version control and change control process of Software development. 4. Understand project management, planning, scheduling, risk management, project and process metrics. 5. Get an overview of open source Software Engineering tool viz. Subversion and understand some concepts such as Re-engineering and Reverse engineering.	**Upon successful completion of the course, the student will be able to:** 1. Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project. (CO1) 2. Select appropriate testing strategy and apply testing principles for testing a given application. (CO2) 3. Apply basics of software configuration management, version control and change control in software development. (CO3) 4. Evaluate cost estimation, effort and severity of software risk for given application. (CO4) 5. Perform basic operations on Sub-version for software version control. (CO5)

Unit No.	Contents	Max. Hrs.
1	Introduction to Software Engineering, A Generic View of process, Process models: Water fall Model, RAD Model, Prototyping Model, Component Development Model, Agile Model, Requirement Engineering: Requirement Engineering Task Initialization Eliciting Requirement, Developing Use Case, Analysis Model, Negotiation, Validation	6
2	Building the Analysis mode: Requirement Analysis, Analysis Modeling Approaches, Data Modeling Concept, Object Oriented Analysis, Types of Modeling, Design Engineering: Design Concept, Design Model.	7
3	Testing Strategies : Strategic Approach, Strategic issues, Strategies for conventional Software, Strategies for Object Oriented Software, Validation Testing, Testing Tactics: White-Box Testing, Basis Path testing: Flow Graph Notation, Independent Program Paths, Control Structure Testing, Black Box Testing, Introduction to object oriented testing.	7
4	Configuration Management: Base lines, Software Configuration items, The SCM Process, Identification of Objects in the Software Configuration, Version Control, Change Control, Configuration Audit, Status Reporting, SCM Standards.	5
5	Project Management, Metrics for Process and Projects, Project Estimation, Risk Management, Reactive vs. Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection.	7
6	Advanced Topics in Software Engineering: Re engineering Computer aided software engineering, Open source SE tools introduction, Example-Subversion: Overview, Typical subversion usage and work flow.	5

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

TEXT BOOKS:

Sr. No	Title	Authors	Edition (Year of Publication)	Publisher
1	Software Engineering–A Practitioner's Approach	Roger S. Pressman	6th	McGraw Hill
2	Software Engineering,	Ian Sommerville,	9th	Pearson

Reference books:

Sr. No	Title	Authors	Edition (Year of Publication)	Publisher
1	Object Oriented Software Engineering	Leth Bridge	6th	TATA McGraw Hill

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

YCCE-CSE- AIML-7

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2255–Lab: Software Engineering

Sr. No.	List of Experiment
1	Introduction to software engineering fundamentals UML, RATIONAL ROSE Interface/ *Star UML (open Source*)
2	To study and create Software Requirement Specification document for given case study
3	To study and draw UML Use Case diagram for the given case study.
4	To study and draw UML Class diagram for given Case Study.
5	To study and draw UML Activity diagram for given Case Study.
6	To study and draw UML Sequence Diagram for given Case Study.
7	To study and draw State Diagram for given Case Study.
8	Write a Program to find out the Estimation (cost and effort) by using COCOMO OR http://vlabs.iitkgp.ernet.in/se/2/
9	To perform manual and Automated testing using USE- CASE tool using sample GUI OR *http://vlabs.iitkgp.ernet.in/se/10/*
10	To Study and execute Version Control using Subversion

		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2256 – Design & Analysis of Algorithms

Objective	Course Outcome
1. To introduce basic algorithmic techniques, time requirements of an algorithm and mathematical techniques used in analysis of algorithms 2. Learn analysis of algorithms for a wide variety of foundational problems occurring in computer science applications with discussions on complexity and NP-completeness.	After completion of the course, student will be able to: CO1 : Remember the concepts of algorithms, CO2 : Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms. CO3 : Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications. CO4 : Apply the knowledge of different algorithms with discussions on complexity. CO5 : Evaluate the knowledge of algorithms with Complexity and NP-completeness.

Unit No.	Contents	Max. Hrs.
1	Mathematical foundations, summation of arithmetic and geometric series, Σn, $\Sigma n2$, bound summations using integration, Analysis of algorithms, analyzing control structures, worst case and average case analysis, Asymptotic notations, Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, external Sorting, lower bound proof.	6
2	Recursive functions and recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions, elementary and advanced data structures with operations on them and their time complexity, Amortized analysis.	7
3	Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform 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, single source shortest paths, optimal binary search trees, traveling salesman problem, Matrix Chain Multiplication, Longest Common Subsequent.	6
5	Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen"s problem, graph colouring, Hamiltonian cycles etc.	6
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.	6

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Text Books:

Sr. No.	Title	Author	Edition	Publisher
1	Computer Algorithms	Horowitz, Sahani, Rajsekharan	Third	Galgotia Publications Pvt. Ltd.
2	Introduction to Algorithms	Thomas H. Cormen	Third	Prentice Hall of India.
3	Algorithm design	Klienberg and Tardos	Latest	Pearson

Reference Book:

Sr. No.	Title	Author	Edition	Publisher
1	Fundamentals of Algorithms	Brassard and Bratley	second	Prentice Hall

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-10

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2257– Lab: Design & Analysis of Algorithms

Sr. No.	List of Experiment
1	To Compute and Analyze its time complexity of various sorting algorithm. • Bubble sort • Insertion sort • Selection Sort
2	To implement and compute time complexity of given problem using Divide and Conquer algorithm. • Merge sort • Quick sort • Binary Search
3	To implement and compute time complexity of Job sequencing problem using Greedy Method for different number of inputs.
4	To implement and compute time complexity of Knapsack Problem using Greedy Method for different number of inputs.
5	To implement and compute time complexity of Dijikstra Problem using Greedy programming for different number of inputs.
6	To implement the given problem using minimum cost spanning trees. • Kruskal Algorithm • Prim Algorithm
7	To implement and compute time complexity of All Pair Shortest Path using dynamic programming for different number of inputs.
8	To implement and compute time complexity of Travelling Salesman Problem using dynamic programming for different number of inputs.
9	To implement and compute time complexity of 8 Queens's problem using backtracking for different number of inputs.
10	To implement and compute time complexity of Graph coloring problem using backtracking for different number of inputs.

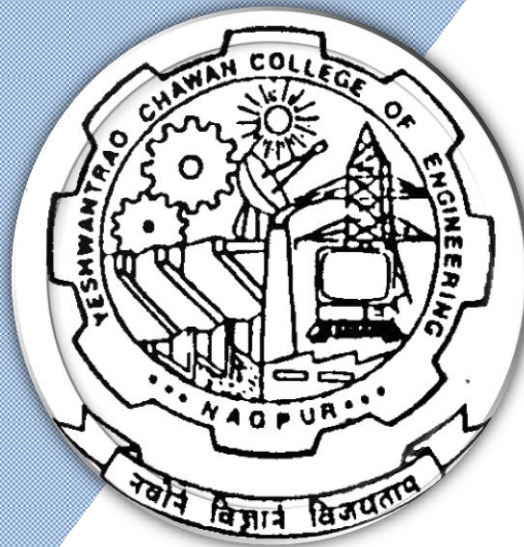|		Jun 2021	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Date of Release	Version	AY 2021-22 Onwards

YCCE-CSE- AIML-11

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2258– Database Management Systems

Objective	Course Outcome
1. To learn different database system concepts 2. To learn the designing of Entity Relationship Diagram. 3. To know relational data model, relational algebra & SQL Queries. 4. To understand relational database design. To know about data integrity issues	Upon successful completion of the course, the student will be able to: 1: Understand & compare different levels of abstraction & data independence. 2: Design Entity Relationship Diagram for any scenario & normalize the database 3: Solve queries based on relational algebra & SQL. 4: Analyze transaction management, various concurrency control protocols and crash recovery methods.

Unit No.	Contents	Max. Hrs.
1	**Introduction to Database Management System:** General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence.	6
2	**SQL:** Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, Joins,SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, PL/SQL. , jdbc connectivity **No SQL databases**: Features of NoSQL databases, Types of NoSQL databases	8
3	**Entity-Relationship Model**: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme	5
4	**Relational Database Design**: Structure of Relational Databases, Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design. **Relational Algebra**: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations.	6
5	**Indexing and Hashing**: Basic of query processing; Indices: Concepts, B+ trees and B -tree index file; Static and dynamic hashing.	6
6	**Transactions:** basic concepts, States, Concurrent execution, Serializability, Recoverability, isolation; **Concurrency control:** Timestamps and locking protocols, Validation based protocols, deadlock handling; Recovery: Log-based recovery, Shadow-paging.	6

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

Text Books

SN	Title	Edition	Authors	Publisher
1	Database System Concepts	6th Edition	Korth, Silberschatz	McGraw-Hill publication
2	Fundamentals of Database Systems	5th Edition	Elmasri, Navathe & Gupta	Pearson Education.

Reference Books

SN	Title	Edition	Authors	Publisher
1	SQL & PL / SQL for Oracle 11g Black Book Kindle Edition	3rd Edition	Dr. P.S. Deshpande	Dreamtech Press
2	Database Systems	3rd Edition	Connolly	Pearson Education
3	Database Systems	6th Edition	S. K. Singh,	Pearson Education

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2021-22

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

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning - CSE (AIML)

SoE No.
AML-203

IV Semester
AIML2259– Lab.: Database Management Systems

Sr. No.	List of Experiment
1	To implement different basic Data Definition Language (DDL) & Data Manipulation Language(DML) Commands in SQL , commands that involve constraints for a given schema
2	To implement aggregate function & grouping commands on a given schema
3	To implement basic set operations in SQL on a given schema
4	To apply BETWEEN…AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause, single row , mutirow functions on created database tables
5	To implement commands for various joins on a given schema
6	Write SQL queries for given schema using Nested Subqueries and SQL Update on a given schema
7	To create and manipulate various database object of table using views.
8	Select any real time problem for database implementation. Draw an ER diagram for the selected problem in hand. Normalise the database up to appropriate normal form.
9	To display file database connectivity using JDBC
10	Create procedures using PL/SQL for given problem definition

		Jun 2021	1.00	Applicable for AY 2021-22 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE- AIML-14

Bachelor of Technology
SoE & Syllabus 2021
5th Semester

(Department of Computer Science & Engineering (CSE)Artificial Intelligence & Machine Learning

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Fifth Semester										
1	5	HS	CSE	AIML2301	Fundamentals of Economics & Management	T	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	CSE	AIML2302	Foundation of Artificial Intelligence	T	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	CSE	AIML2303	**Lab:** Foundation of Artificial Intelligence	P	0	0	2	2	1		60	40	
4	5	PC	CSE	AIML2304	Machine Learning Essentials	T	3	0	0	3	3	30	20	50	3 Hours
5	5	PC	CSE	AIML2305	**Lab:** Machine Learning Essentials	P	0	0	2	2	1		60	40	
6	5	PE	CSE		**Professional Elective-I**	T	3	0	0	3	3	30	20	50	3 Hours
7	5	PE	CSE		**Lab: Professional Elective-I**	P	0	0	2	2	1		60	40	
8	5	OE	CSE		**Open Elective - I ***	T	3	0	0	3	3	30	20	50	3 Hours
9	5	OE	CSE		**Open Elective - II ***	T	3	0	0	3	3	30	20	50	3 Hours
10	5/6	STR	CSE	AIML2310	Seminar	P	0	0	0	0	1		100		
					TOTAL FIFTH SEM		18	0	6	24	22				

* Refer list Open Elective- I & II

List of Professional Electives-I & II
Professional Electives -I

1	5	PE-I	CSE	AIML2311	PE I: Design Patterns
	5	PE-I	CSE	AIML2312	PE I: **Lab:** Design Patterns
2	5	PE-I	CSE	AIML2313	PE I: Embeded AI
	5	PE-I	CSE	AIML2314	PE I: **Lab:** Embeded AI
3	5	PE-I	CSE	AIML2315	PE I: Business Intelligence
	5	PE-I	CSE	AIML2316	PE I: **Lab:** Business Intelligence
4	5	PE-I	CSE	AIML2317	PE I: Advanced Web Technologies
	5	PE-I	CSE	AIML2318	PE I: **Lab:** Advanced Web Technologies

Open Elective 1

1	5	**OE1**	CSE	AIML2331	OE I: Introduction to Artificial Intelligence
2	5	**OE1**	CSE	AIML2332	OE I: Software Testing

Open Elective 2

1	5	**OE2**	CSE	AIML2341	OE II: Introduction to Machine Learning
2	5	**OE2**	CSE	AIML2342	OE II: Problem solving Techniques and Statistical methods

Audit Courses

1	5	HS		AU2126	YCCE Communication Aptitude Preparation (YCAP5.1) for CV,ME,CT,IT,CSE, IIoT, AIDS, CSD, AIML	A	3	0	0	3	0				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

				June 2022	1.01	**Applicable for AY 2023-24 Onwards**
Chairperson		**Dean (Acad. Matters)**		**Date of Release**	**Version**	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2301 - Fundamentals of Economics & Management

AIML2301	Fundamentals of Economics & Management			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Explain the Functions of Management and identify tools and techniques of Marketing of goods and services
2. Analyze the role of Financial Accountancy and Management in the Organization
3. Develop perspective about economy based on logical reasoning and estimate the economic outcomes.
4. Interprets comparative advantage of resources.

Unit:1	Principles of Management	7 Hours
	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	**Marketing Management**	**7 Hours**
	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.	
Unit:3	**Financial Accountancy and Management**	**7 Hours**
	Definition & Functions of Finance department, Sources of finance, Types of capital, Types of Taxes, Introduction of Accountancy and its rules, Preparation of Books of Account- Jounal, Posting of transaction into ledger and preparation of trial balance, Introduction of trading account, profit and loss account and balance sheet	
Unit:4	**Introduction to Economics and engineering Economy:**	**6 Hours**
	Economics and engineering economy, Utility analysis- Cardinal, ordinal, Law of diminishing marginal utility, Laws of demand and supply, elasticity of demand, its measurement and application.	
Unit:5	**Engineering Production and Costs**	**7 Hours**

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Concepts and types of costs, Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation.

Unit :6	**Market structures - equilibrium output and price**	**7 Hours**

Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duopoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination.

Total Lecture Hours	**39 Hours**

Textbooks	
1.	Principle of Management, 9th edition , Harold Koontz Ramchandra, Tata McGrow hills
2.	Marketing Management: Planning, Implementation and Control, 3rd Edition, Ramaswamy V.S. and Namakumari S, Macmillian
3.	Financial Services, 19th Edition, Khan M Y, Tata McGraw Hill, 19
4.	Modern Economics, 13th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5.	Modern Economic Theory, 3rd edition, K. K. Devett, S. Chand Publisher,2007
6.	Principle of Economics, 7th edition, Mankiw N. Gregory, Thomson, 2013
Reference Books	
1.	Foundations of Financial Markets and Institutions, 3rd Edition, Fabozzi, Pretice Hall
2.	Fundamentals of Financial Instruments , 2nd Edition, Parameshwaran, Wiley India
3.	Marketing Management , 3rd Edition , RajanSaxena, Tata McGraw Hill
4.	Advance Economic Theory, 17th Edition, H. L. Ahuja**,** S. Chand Publisher, 2009
5.	International Trade, 12th edition, M. L. Zingan, Vindra Publication, 2007
6.	Macro Economics, 11th edition, M. L. Zingan, Vindra Publication, 2007
7.	Monitory Economics:, 1st Edition, M. L. Sheth, Himayalaya Publisher, 1995
8.	Economics of Development and Planning, 12th edition, S. K. Misra and V. K. Puri, Himalaya Publishing House, 2006.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc22_mg104/preview
2	https://nptel.ac.in/
3	https://onlinecourses.nptel.ac.in/noc20_mg31/preview
4	https://onlinecourses.nptel.ac.in/noc21_hs52/preview
5	https://onlinecourses.nptel.ac.in/noc22_hs67/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2302 - Foundation of Artificial Intelligence

AIML2302	Foundation of Artificial Intelligence			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to
C01: Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
C02: Identify problems where artificial intelligence techniques are applicable
C03: Formulate problems as state space search problem & efficiently solve them.
C04: Solve various constraint satisfaction problem and game playing techniques.
C05: Reasoning with uncertainty and Machine learning algorithms

Unit:1	Introduction to AI	6 Hours

Introduction to AI, The History of Artificial Intelligence, Strong AI, Weak AI, Intelligent Agents: Agents & environments, Concept of Rationality, Nature of Environments, The Structure of Agents, Application of AI.

Unit:2	Search Techniques	8 Hours

Solving Problems by Searching: Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Space, Searching with Non deterministic actions.

Unit:3	Adversarial Search	7 Hours

Games Theory, Optimal decision in games, The Mini-Max Algorithm, Alpha-Beta pruning, Constraint Satisfaction Problem, Constraint Propagation, Backtracking Search, Local Search for Constraint Satisfaction Problems.

Unit:4	Knowledge Representation	6 Hours

Knowledge representation: issues, representation and mapping approaches, procedural vs. declarative knowledge, Introduction to propositional logic, Forward Reasoning, Backward Chaining, unification and resolution algorithms.

Unit:5	First Order Logic	6 Hours

Syntax, Semantic of first order logic, Symbols of Interpretations, Quantifiers, Equality,   Using First

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Order Logic, Assertions and Queries in first order logic, Knowledge engineering in first order logic, propositional vs first order logic, Unification and lifting, Forward chaining, Backward Chaining.

Unit :6	Reasoning in Uncertain Domain	6 Hours

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 inference in Bayesian Networks.

Total Lecture Hours	39 Hours

Textbooks	
1	Artificial Intelligence A Modern Approach, Stuart Russell,Peter Norvig, Pearson
2	Artificial Intelligence, Third edition, by E. Richand K. Knight and S. Nair, McGraw Hill
Reference Books	
1	Introduction to Artificial Intelligence and Expert System, D. W. Patterson, PHI
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc23_cs92/preview
2	https://onlinecourses.nptel.ac.in/noc23_ge40/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE-4

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2303 – Lab: Foundation of Artificial Intelligence

AIML2303			LAB – Foundation of Artificial Intelligence		L=0	T=0	P=2	CREDITS = 1
EVALUATION SCHEME								
MSPA – I	MSPA –II		MSPA – III	MSPA – IV	ESE	TOTAL	ESE DURATION	
15	15		15	15	60	100	--	

Sr. No.	Experiments based on
1	To implement 8-puzzle problem using uniformed searching technique: Depth First Search
2	To implement Missionaries and cannibal Problem using uniformed searching technique: Breath First Search
3	To implement Heuristic (Steepest Ascent) Search for Tic-Tac-Toe game problem.
4	To implement Min-Max Algorithm for game solving.
5	To implement Best First Search for Travelling Salesman Problem.
6	To implement A* Algorithm for Travelling Salesman Problem and compare it with Best First Search.
7	To implement 8 Queens Problem.
8	To implement Resolution theorem (Negation).
9	To implement Naïve Bayes Classifiers.
10	To implement and demonstrate Bayesian network using pgmpy.

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2304 – Machine Learning Essentials

AIML2304	Machine Learning Essentials			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
After undergoing the course, student will be able to: 1. Understand various supervised machine learning algorithms   2. Understand various unsupervised machine learning algorithms   3. apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task.   4. understand various performance evaluation measures for supervised and unsupervised learning

Unit:1	**Introduction to machine learning**	**6 Hours**
	Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.	

Unit:2	**Supervised Learning-1**	**6 Hours**
	Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance, Overfitting, and Underfitting	

Unit:3	**Supervised Learning-2**	**6 Hours**
	Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning	

Unit:4	**Unsupervised Learning**	**6 Hours**
	k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Introduction to Principle Component Analysis, evaluation metrics for unsupervised learning	

Unit:5	**Design and Analysis of Machine Learning Experiments**	**6 Hours**
	Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.	

Unit :6	**Advances in Machine Learning**	**6 Hours**
	Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks, Introduction to deep learning, deep learning frameworks.	

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Total Lecture Hours		**36 Hours**
Textbooks		
1	Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition	
2	Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/)	
Reference Books		
1	Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997	
2	Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY	
3	Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/.	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc21_cs24/preview	
2	https://onlinecourses.nptel.ac.in/noc21_cs85/preview	

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2305 – Lab: Machine Learning Essentials

AIML-2305 LAB – Machine Learning Essentials			L=0	T=0	P=2		CREDITS = 1
MSPA – I	MSPA –II	MSPA – III	MSPA – IV		ESE	TOTAL	ESE DURATION
15	15	15	15		60	100	--

Sr. No.	Experiments based on
1	a) Linear regression using linear least squares fit method b) Linear regression with Ordinary least squares method using ML Library
2	a) Implementing linear classifier using Linear discriminant function b) Implementing polynomial regression
3	Program for Classification using KNN algorithm
4	Implementing KNN for regression
5	Implementing Naïve Bayes Classifier
6	Decision Trees using Scikit-learn
7	Implementing SVM Classifier
8	Implementing K-means clustering
9	Dimensionality reduction using Principal Component Analysis
10	Implementing a feed forward Neural Network based estimation using Scikit learn
11	Experiment on classification using Pre-trained deep network

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2311 – PE I: Design Patterns

AIML2311	PE I: Design Patterns			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Understand the fundamentals of design pattern.
2. Apply object oriented techniques and tools to Implement various design patterns.
3. Analyze the complexity of design patterns.
4. Design solution for various types of patterns.

Unit:1	**Introduction**	**7 Hours**

Introduction to Design Patterns and Observer Pattern: Basics of Design patterns, Description of design patterns, Catalog and organization of catalog, design patterns to solve design problems, selection of design pattern, Use of design patterns.

Unit:2	**Creational Patterns**	**7 Hours**

Abstract Factory, Builder, Factory Method, Prototype, Singleton, Creational Patterns

Unit:3	**Structural Pattern**	**6 Hours**

Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion of Structural Patterns

Unit:4	**Behavioural Patterns**	**6 Hours**

Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns

Unit:5	**A Case Study**	**6 Hours**

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation, Summary

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	Complexity Analysis of Design Patterns	6 Hours
Complexity Analysis of Design Patterns, Methods to analyze the complexity of design patterns, Implementation techniques and applications of design pattern in game design, product design		
Total Lecture Hours		**38 Hours**

Textbooks	
1	Head First Design Patterns, Eric Freeman and Elisabeth Freeman
2	Design Patterns Explained, Shalloway and Trott
Reference Books	
1	Pattern's in JAVA Vol-I , Mark Grand , Wiley DreamTech.
2	Pattern's in JAVA Vol-II , Mark Grand , Wiley DreamTech.
3	Introduction to design Patterns in C++ with Qt , Alan Ezust, Paul Ezust
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/59-Design%20Pattern_7th%20Semester_Head%20First%20Design%20Patterns.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc23_cs46/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2312 –Lab PE I: Design Patterns

AIML2312	LAB – PE I: Design Patterns	L=0	T=0	P=2	CREDITS = 1

EVALUATION SCHEME							
MSPA – I	MSPA – II	MSPA – III	MSPA – IV	ESE	TOTAL	ESE DURATION	
15	15	15	15	60	100	--	

Sr. No.	Experiments based on
1	Create a design template for a specific problem arises during development of software application.
2	Write a java program to create a shape and concrete class implementing these interfaces. (Factory pattern).
3	Write a java program to create a single object class. (Singleton pattern).
4	Write a java program to create an abstract class shape and concrete classes extending the shape class. (Prototype design pattern).
5	Write a java program to create an adapter class media adapter which implements the media player interface and uses advance media player object to play required format (adapter design pattern).
6	Write a java program to create employee class to add department level hierarchy and print all employees. (Composite design Pattern)
7	Write a Java Program to create Shape interface and add a Shape Decorator Class an additional feature as Red Shape Decorator and give output as Red Shape Circle or Rectangle(Decorator Pattern)
8	Write a java program to create draw api interface which is acting as a bridge implementer and concrete classes redcircle, greencircle implementing drawapi interface.(bridge design pattern).
9	Write a java program to create a Shape interface and concrete classes implementing the Shape interface. A facade class Shape Maker is defined as a next step.(Façade Pattern)
10	Write a java program to create two objects , Stock which gives command and Broker which invokes the object and implement the interface Order.(Command Pattern)

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2315 –PE I: Business Intelligence

AIML2315	PE I: Business Intelligence			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:

Upon successful completion of the course

After completion of the course 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)

1. Apply Multiple programing language for BI (PO2-3)

2. Model a business scenario; identify the metrics, indicators, various dimensions, and aggregation strategies and make recommendations to achieve the business goal (PO3-3)

3.Obtain hands on experience with some popular BI software for analysis, reporting, visualization of results

(PO1-2, PO2-2,PO3-2,PO5-3)

After completion of the course:

Unit:1	**Introduction to Business Intelligence**	**8 Hours**
Business intelligence: Overview, 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		

Unit:2	**Principles of Dimensional Modelling**	**7 Hours**
Foundation for Fact based decision making, The STAR and SNOWFLAKE schema, Pros & Cons of the STAR/SNOWFLAKE Schema Dimensional Model, Slowly Changing Dimension tables, Fact-less Fact Tables, Aggregation Strategy, Time Dimension		

Unit:3	**Data Pre-processing**	**7 Hours**
Basics of Data Integration (Extraction Transformation Loading): Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data – types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL		

Unit:4	**Business Intelligence system architecture**	**6 Hours**

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

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.

Unit:5	BI Project Lifecycle	6 Hours

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

Unit :6	Self-service Analytics and USE Cases	6 Hours

Self-service Analytics: Overview, pros, cons. Use cases of self-service analytics.

Use cases of Business Intelligence (BI): Water quality monitoring, Air quality monitoring, Waste management, Energy efficiency, Climate change.

Total Lecture Hours	40 Hours

Textbooks	
1	Turban E., Sharda R., Delen D., King D., Business Intelligence, Pearson Education.
2	Microsoft Power BI complete reference, Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Brett Powell. Birmingham, UK : Packt Publishing, 2018.

Reference Books	
1	Sabherwal R. and Becerra-Fernandez I., Business Intelligence, Wiley
2	Kimball R., Ross M., The Kimball Group Reader: Relentlessly Practical Tools for Data Warehousing and Business Intelligence, Wiley and Sons (2010).

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/26.Business%20Intelligence_%20The%20Sav%20-%20David%20Loshin_1391.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/book%20details/CSD.aspx

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc21_mg65/preview
2	https://nptel.ac.in/courses/110107092

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE-13

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2316 –Lab PE I: Business Intelligence

AIML2316			LAB – PE I: Business Intelligence		L=0	T=0	P=2	CREDITS = 1
EVALUATION SCHEME								
MSPA – I	MSPA –II		MSPA – III	MSPA – IV	ESE	TOTAL	ESE DURATION	
15	15		15	15	60	100	--	

Sr. No.	Experiments based on
1	a. Design a multidimensional data cube for given data Using EXCEL b. Perform OLAP- slicing operation on it
2	Creation Of Dashboard Using EXCEL
3	Microsoft Power BI: Installation tool, Importing Data from file, Data Wrangling (Editing Data).
4	Visualization Of Data Using different visualizations in Power BI analytic desktop, Filtering data, and delivering Insights from data
5	Data Visualization: Create interactive and visually appealing dashboards and reports to present data in a meaningful way, making it easier to identify patterns and trends. (Data available with BI server)
6	Case study 1- Supply Chain Analytics: Analyze supply chain data to improve efficiency, reduce costs, and identify potential bottlenecks in the supply chain process.
7	Case study 2 - Business Performance Monitoring: Monitor key performance indicators (KPIs) in real-time and track business metrics to evaluate the performance of the organization.
8	Case study 3- Geographic Analysis: Utilize geographic information system (GIS) data to create location-based visualizations and perform spatial analysis.

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2317 –PE I: Advanced Web Technologies

AIML2317	PE I: Advanced Web Technologies			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to   1. Understand fundamental concepts of Web Services.   2. Design modern interactive web pages using HTML5, CSS3, Javascript.   3. Develop advanced client side programming.   4. Develop fast, flexible, and scalable backend applications using nodejs and mongoDB .

Unit:1	**Introduction to Web Technology**	**6 Hours**
Client, Servers and Communication, Internet Protocols (HTTP,FTP, SMTP),WWW. Web Basics: Web Browsers, Web Servers, Tier Technology and its types, Static and Dynamic Web Page. Client side and Server side Scripting.		

Unit:2	**HTML5,CSS3**	**7 Hours**
HTML5: Structure of an HTML Program, Basic HTML Tags (Headings, Paragraph, Division, Text formatting, Image, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Links (href attribute, target attribute), HTML colors, Table handling in HTML, HTML Layout Elements, HTML class and id Attribute, HTML Forms, HTML Responsive Web Design. CSS3: Inline, Internal, External, CSS3 selectors, CSS3- Colors, Backgrounds, Borders, Text, Font, List, CSS3 Box Model, CSS3 Navigation Bar (Vertical, Horizontal), Introduction to Bootstrap.		

Unit:3	**Client Side Scripting with JavaScript**	**7 Hours**
Introduction to JavaScript, Variables and Data Types, Operators and Expressions in JavaScript, Functions In JavaScript, Arrays, Loops and control statement, RegExp, Dialog Boxes, JavaScript Events. Event Handling and Form Validation, Error Handling, Handling Cookies, XML, JSON. Introduction to Web Frameworks- React JS, Angular JS.		

Unit:4	**Advanced Client side programming**	**6 Hours**
WebSockets, Server-Sent Event (SSE), WebRTC, Web Graphics, Canvas, WebGL, WebWorkers, SVG. Libraries: Modernizr, Polyfills, Polymer.		

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit:5	**Introduction to Node.js**	**6 Hours**
	Introduction, Modules, HTTP Module, File System Module, URL Module, NPM, Events, Upload Files.	
Unit :6	**Node.js and Database Connectivity with MongoDB**	**6 Hours**
	Introduction to MongoDB, Creating a Database, Create Collection, Insert, Find, Delete, Update, Node.js Connection with MongoDB.	
Total Lecture Hours		**38 Hours**

Textbooks	
1	HTML & CSS: The Complete Reference,Fifth Edition, Thomas A. Powell
2	Web Technologies: Html, Javascript, Php, Java, Jsp, Asp.Net, Xml And Ajax, Black Book , Kogent Learning Solutions Inc., Dreamtech Press
Reference Books	
1	Pro HTML5 with CSS, JavaScript, and Multimedia., Mark J. Collins
2	Web Development with MongoDB and Node., Bruno Joseph D'mello
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/book%20details/CSE.aspx
2	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-5409-3
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2318–Lab PE I: Advanced Web Technologies

AIML2318		LAB – PE I: Advanced Web Technologies	L=0	T=0	P=2	CREDITS = 1
EVALUATION SCHEME						
MSPA – I	MSPA –II	MSPA – III	MSPA – IV	ESE	TOTAL	ESE DURATION
15	15	15	15	60	100	--

Sr. No.	Experiments based on
1	Write a HTML code to create single page website using Layout Elements
2	Write a HTML code to create responsive website using <meta> tags.
3	Create a JavaScript Calculator using the JavaScript, HTML and CSS programming languages.
4	Creating Image Slider Using JavaScript, HTML, And CSS
5	Write JavaScript code to validate the following fields of the Registration form. First Name: Last Name: Password: Email ID: Mobile Number: Address:
6	Write a script which creates and retrieves Cookies information
7	Create a web page which shows the use of Canvas & SVG
8	Creating the MongoDB Database in Robo 3T GUI
9	Create a simple "Hello, World!" server using Node.js and Express.
10	Create a RESTful API that performs CRUD operations on a database

Chairperson	Dean (Acad. Matters)	June 2023	1.02	Applicable for AY2023-24 Onwards
		Date of Release	Version	

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester

AIML2331 – OE I: Introduction to Artificial Intelligence

AIML2331	OE I: Introduction to Artificial Intelligence			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to
1.   Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.

Unit:1	**Introduction to AI**	**6 Hours**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, Representation the AI Problems, Production System		
Unit:2	Knowledge Representation	**6 Hours**
Predicate and propositional logic , Forward and Backward Chaining , Backtracking		
Unit:3	**Local Search Algorithms and Optimization Problems**	**6 Hours**
Local Search in Continuous Space, Searching with Non deterministic actions, Searching with partial observations, online search agents and unknown environments.		
Unit:4	**Adversarial Search & Games**	**6 Hours**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, and Limitations of Game Search Algorithms.		
Unit:5	**Uncertainty in AI**	**6 Hours**
Conditional Reasoning & Bayes Rule, Bayesian Networks, Maximum Likelihood Learning, Maximum A-posterior learning, Markov Decision Processes		
Unit:5	**Introduction to Knowledge**	**6 Hours**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering		
Total Lecture Hours		**36 Hours**

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Elaine Rich, Kevin Knight, Shivshankar Nair, Artificial Intelligence, McGraw Hill.

Reference Books	
1	R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
2	Murray Shanahan: A Circumscriptive Calculus of Events. Artificial. Intelligence 77(2), pp. 249-284, 1995.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Handbook of Artificial Intelligence, Edited By Avronn Barr and Edward Feigenbaum https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf
2	Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs42/

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE-19

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2332 – OE I: Software Testing

AIML2332	OE I: Software Testing			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Formulate problem by following Software testing life cycle.
2. Design Manual Test cases for Software testing approaches.
3. Demonstrate utilization of testing automation though testing tool.

1	**Basic concepts of Testing**	**6 Hours**
Need of Testing, Basic concepts-errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.		
2	**Unit Testing**	**7 Hours**
Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing.		
3	**Control Flow Testing**	**7 Hours**
Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage.		
4	**Data Flow and System Integration Testing**	**6 Hours**
Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration.		
5	**System Testing**	**6 Hours**
Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test.		
6	**Test Design**	**6 Hours**
Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution.		
Total Lecture Hours		36 Hours

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Software Testing and Quality Assurance ,1st Edition, Kshirsager Naik and Priyadarshini Tripathi , Wiley
2	Software Testing Principles, Techniques and tools, 1st Edition, M. G. Limaye , McGraw Hills
Reference Books	
1	Foundations of Software Testing, 2nd Edition, Aditya P. Mathur , Pearson Education.
2	Software Testing Principles, Techniques and tools, 1st Edition, M. G. Limaye , McGraw Hills
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
2	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs13/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs61/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE-21

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2341 – OE II: Introduction to Machine Learning

AIML2341	OE II: Fundamentals of Machine Learning		L= 3	T=0	P=0	Credits=3	
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
After undergoing the course, student will be able to: 1. Understand various supervised machine learning algorithms 2. Understand various unsupervised machine learning algorithms 3. Apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task. 4. understand various performance evaluation measures for supervised and unsupervised learning

Unit:1	**Introduction to machine learning**	**6 Hours**

Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.

Unit:2	**Supervised Learning-1**	**6 Hours**

Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance,Overfitting, and Underfitting

Unit:3	**Supervised Learning-2**	**6 Hours**

Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning

Unit:4	**Unsupervised Learning**	**6 Hours**

k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Evaluation metrics for unsupervised learning

Unit:5	**Design and Analysis of Machine Learning Experiments**	**6 Hours**

Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.

Unit :6	**Advances in Machine Learning**	**6 Hours**

Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks.

Total Lecture Hours	**36 Hours**

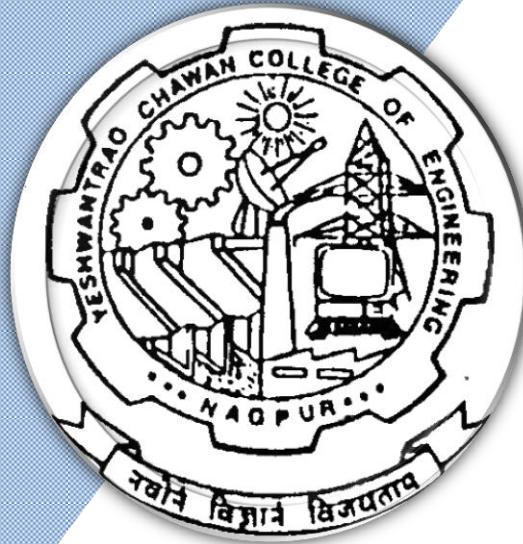|		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition
2	Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/)
Reference Books	
1	Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997
2	Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY
3	Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e- copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs24/preview
2	https://onlinecourses.nptel.ac.in/noc21_cs85/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

YCCE-CSE-23

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

V Semester
AIML2342 – OE II: Problem solving Techniques and Statistical methods

AIML2342	OE II: Problem solving Techniques and Statistical methods			L= 3	T=0	P=0	Credits=3
Evaluation Scheme	**MSE-I**	**MSE-II**	**TA**	**ESE**	**Total**		**ESE Duration**
	15	**15**	**20**	**50**	**100**		**3 Hrs**

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Apply Techniques of Problem solving for the solution of mathematical problems. 2. Solve problems related to Numbers, Sets, and Functions, Induction, Combinatorics. 3. Define, formulate and solve problems in a systematic manner. 4. Understand fundamental concepts of data analysis using statistics.

Unit:1	**Introduction**	**6 Hours**
	Numbers, Sets and Functions, Problem Solving Techniques,Language and Proofs, Quantifiers and Logical Statements, Compound Statements, Elementary proof techniques.	
Unit:2	**Combinatorics**	**7 Hours**
	Induction, Bijection and Cardinality, Combinatorics,	
Unit:3	**Graph**	**7 Hours**
	Counting, Graph Theory, Recurrence Relations	
Unit:4	**Basic Statistics**	**6 Hours**
	Sources of Data, Organization of Data, The Histogram, Measures of central tendency, Mean Deviation, Standard Deviation, Correlation, Coefficient of correlation, Rank correlation, Regression.	
Unit:5	**Probability**	**6 Hours**
	Equally likely, mutually exclusive events, definitions of probability, additions & multiplication theorems of probability and problems based on them. Bayesian approach, distributions; Poisson, normal, Erlang, Gamma and Weibull probability distributions	
Unit :6	**Multivariate Data**	**6 Hours**
	Random Vectors and Matrices, sample estimate of centroid, standard deviation, SSCP, dispersion, variance, covariance, correlation matrices.	
Total Lecture Hours		**38 Hours**

		June 2023	1.02	Applicable for
				AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Mathematical Thinking-Problem Solving and Proofs. 2nd Edition (2000), JohnP.D'Angelo and Douglas B.,Prentice Hill , West
2	Statistics for Management, Levin R.I. and Rubin D.S., Pearson education
Reference Books	
1	Probability and Statistics , Third edition ,Murray R. Spiegel, John J.Schiller, R AluSrinivasan, Mc Graw Hill education
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/111105077
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

		June 2023	1.02	Applicable for AY2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	

Bachelor of Technology

SoE & Syllabus 2021

6th Semester

(Department of Computer Science & Engineering (CSE)Artificial Intelligence & Machine Learning

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No.
AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
							\multicolumn{4}{c} Contact Hours				% Weightage			
Sixth Semester															
1	6	PC	CSE	AIML2351	Advanced Artificial Intelligence	T	3	0	0	3	3	30	20	50	3 Hours
2	6	PC	CSE	AIML2352	**Lab:** Advanced Artificial Intelligence	P	0	0	2	2	1		60	40	
3	6	PC	CSE	AIML2353	Computer Networks	T	3	0	0	3	3	30	20	50	3 Hours
4	6	PC	CSE	AIML2354	**Lab:** Computer Networks	P	0	0	2	2	1		60	40	
5	6	PC	CSE	AIML2355	Digital Image Processing	T	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	CSE	AIML2356	**Lab:** Digital Image Processing	P	0	0	2	2	1		60	40	
7	6	PE	CSE		**Professional Elective-II**	T	3	0	0	3	3	30	20	50	3 Hours
8	6	PE	CSE		**Lab: Professional Elective-II**	P	0	0	2	2	1		60	40	
9	6	OE	CSE		**Open Elective - III ****	T	3	0	0	3	3	30	20	50	3 Hours
10	6	OE	CSE		**Open Elective - IV ****	T	3	0	0	3	3	30	20	50	3 Hours
\multicolumn{6}{r} **TOTAL SIXTH SEM**			18	0	8	26	22				

Professional Electives -II

	6	PE-II	CSE	AIML2361	PE II: Blockchain Technology
1	6	PE-II	CSE	AIML2362	PE II: **Lab:** Blockchain Technology
	6	PE-II	CSE	AIML2363	PE II: Internet of Things
2	6	PE-II	CSE	AIML2364	PE II: **Lab:** Internet of Things
	6	PE-II	CSE	AIML2365	PE II: Cloud computing
3	6	PE-II	CSE	AIML2366	PE II: **Lab:** Cloud Computing

Open Elective 3

1	6	OE3	CSE	AIML2371	OE III: Introduction to Artificial Intelligence
2	6	OE3	CSE	AIML2372	OE III: Software Testing

Open Elective 4

1	6	OE4	CSE	AIML2381	OE IV: Introduction to Machine Learning
2	6	OE4	CSE	AIML2382	OE IV: Problem solving Techniques and Statistical methods

Audit Courses

1	6	HS		AU2130	YCCE Communication Aptitude Preparation (YCAP6.3) for CT, IT, CSE, IIoT, AIDS, CSD, AIML	A	3	0	0	3	0				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

		June 2022	1.01	
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	**Applicable for AY 2022-23 Onwards**

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2351– Advanced Artificial Intelligence

Course Outcomes:

Upon successful completion of the course the students will be able to

C01: Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
C02: Identify problems where artificial intelligence techniques are applicable
C03: Formulate problems as state space search problem & efficiently solve them.
C04: Solve various constraint satisfaction problem and game playing techniques.
C05: Understand the capabilities and limitations of Generative AI.

Unit:1	Planning Techniques	6 Hours

Definition of AI, Application of AI,Classical Planning, Algorithms for planning as state space search, Planning Graph, Time, Schedule and resources, Hierarchical planning, Planning & acting in Non deterministic domain, Multiagent Planning.

Unit:2	Knowledge Learning	7 Hours

Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming, Learning Probabilistic Models, Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm

Unit:3	Reinforcement Learning	7 Hours

Introduction, Active and Passive Reinforcement learning, Generalization in Reinforcement Learning, Policy Searching, Applications of Reinforcement Learning, Q Learning, Genetic Algorithm for Reinforcement Learning.

Unit:4	Robotics	6 Hours

Introduction, Robot Hardware, Robotics Perception, Planning to move, Planning Uncertain Movements, Moving, Robotics Software Architecture, Application Domains, Case Study related to Robotics.

Unit:5	Generative AI	6 Hours

What is Generative AI? What is generative AI and how does it differ from traditional AI?
Generative AI system: ChatGPT, Generative Adversarial Network- GAN architecture, Generative model, Approaches of Generative model ,Naive Bayes generative model, Types of GANs, Applications of GANs

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	Introduction to Large Language Models (LLMs)	6 Hours
Large language models working, Use of Large language models, advantages of large language models, challenges and limitations of large language models, types of large language models, Applications of Large Language Models		

Textbooks	
1.	Artificial Intelligence A Modern Approach, Third Edition by Stuart J. Russell and Peter Norvig
2.	Introduction to Generative AI :An ethical, societal, and legal overview Numa Dhamani and Maggie Engler
Reference Books	
1.	ARTIFICIAL INTELLIGENCE Third Edition, by Kevin Knight (Author), Elaine Rich (Author), Shivashankar B. Nair (Author)
2.	Artificial Intelligence: Concepts and Applications, by Lavika Goel
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc23_ge40/announcements?force=true#registration_confirmation
2.	https://www.youtube.com/watch?v=XCPZBD9lbVo&list=PLbMVogVj5nJQu5qwm-HmJgjmeGhsErvXD

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester
AIML2352– Lab: Advanced Artificial Intelligence

(Practical's based on above syllabus)

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2353– Computer Networks

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Identify appropriate design issues and explain network reference model.
2. Select appropriate protocol at various layers for the given application.
3. Solve problems in the networking domain.
4. Analyze the performance of network using different tools
5. Design computer networks and sub-networks

Unit:1	Introduction to computer networks and Internet	5 Hours

Introduction to computer networks and Internet, The uses of computer networks, LAN's, MAN's, WAN's, Heterogeneous Networks Network Topologies, Physical Mediums, Concept of Network Protocols, design issues for layers. Layered Architecture: The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference models, Various Losses in the Internet, Brief History of Computer Network.

Unit:2	Application Layer	7 Hours

Basics of Socket Programming, Transport Layer Programming Interface(TCP, UDP) , Protocols: HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Cachess) , SMTP (Overview, Message Formats) , IMAP, POP, DNS; FTP; Telnet, SSH; Peer-to-Peer Applications, BitTorrent Protocol; Conte Distribution Networks;

Unit:3	Transport Layer	7 Hours

Relationship Between Transport and Network Layer, TCP and UDP; Multiplexing and Demultiplexing; Principles of Reliable Data Transfer; Go-Back-N and Selective Repeat; TCP: Segment Structure, Round Trip Time Estimation, Reliable Data Transfer, State Transitions, Flow Control, Congestion Control, UDP: Segment Structure

Unit:4	Network Layer	7 Hours

Subnets, Concept of IP Address, Netmask, Subnet; CIDR; Design of a LAN and WAN,r, Routers, Functions of a Router; Switching; Queueing: Causes, Delays; IPV4: Datagram Format, Fragmentation; Network Address Translation; IPv6 Introduction; Multicasting, , Routing algorithms: Link State, Distance Vector Routing; OSPF, BGP, RIP; Routing Policies

Unit:5	Link Layer	5 Hours

Review of fundamentals of link layer protocols; Error-Detection and -Correction Techniques Ethernet Switches, LANs, LinkLayer Switches, VLANs, Complete tracking of traversal of a packet over internet between two application, MAC

Unit :6	Transmission Impairments, Transmission Media	5 Hours

Guided, unguided, Architecture of the Internet, Wireless LANs: IEEE 802.11, IEEE 802., The Public Switched Telephone Network, Switching: circuit, packet and message switching, Modems.

Total Lecture Hours	36 Hours

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Computer Networking: A Top-Down Approach, 6th Kurose and Ross, Pearson Publication
2	Computer Networks, Behrouz A. Forouzan ,McGraw-Hill Publication
3	Computer Networks , A.S. Tanenbaum, Pearson Publication
Reference Books	
1	Computer Networks A Systems Approach,ISBN: 9780123850591,Larry Peterson Bruce Davie Elsevier
2	Data and computer Communication, ISBN-81- 297-0206-1, William Stallings, Pearson Education
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/40-Guide%20to%20computer%20network%20security.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/58-Computer%20Networks%205th%20Edition.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105183
2	https://nptel.ac.in/courses/106106091

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2354– Lab: Computer Networks

Sr. No.	Experiments based on
1	Study of Network Devices and Network cables.
2	Study of basic network command and Network configuration commands.
3	Create two Networks using star topology and add a resource (printer) to the network using CISCO Packet Tracer. Also show the transmission of packet from one host to other.
4	Configuring VLAN in a network using CISCO Packet Tracer.
5	Configure routers in a network using Static routing protocol in Cisco Packet Tracer and show transmission of packet from one network to another.
6	To implement Routing algorithm OSPF: Open Source Shortest Path First using Cisco Packet Tracer.
7	Use traffic monitoring tool Wire shark to observe network traffic with packet detail.
8	Case Study on Network at YCCE.
9	Advanced Practical: Study of NS2 tool.

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2355– Digital Image Processing

Course Outcomes:
Upon successful completion of the course the students will be able to
1.   Describe Basic relationships between pixels.
2.   Compare various image enhancement techniques in spatial domain and frequency domain.
3.   Illustrate different image compression techniques to understand the advantage of image compression
4.   Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.
5.   Interpret various representation techniques

Unit:1	**Introduction**	**5 Hours**
	Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception, Fundamentals of Image processing, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels.	

Unit:2	**Image Enhancement in the Spatial Domain**	**6 Hours**
	Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.	

Unit:3	**Transforms & Image Enhancement in the frequency Domain**	**7 Hours**
	Transforms: Introduction to the Fourier Transform, Discrete Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, **Image Enhancement in the frequency Domain:** Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.	

Unit:4	**Image Compression**	**5 Hours**
	Fundamentals of Image compression, coding redundancy, spatial and temporal redundancy, Measuring Image Information, Fidelity criteria, Image compression models, Basic compression methods, Huffman coding, arithmetic coding, LZW coding, run length coding.	

Unit:5	**Image Segmentation**	**6 Hours**
	Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation.	

Unit :6	**Image Representation**	**5 Hours**
	Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors. Introduction to color image processing: RGB and HSI color models.	

Total Lecture Hours		**38 Hours**

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Digital Image Processing, 3rd edition 2007, Rafael C. Gonzalez and Richard, E. Woods, Prentice Hall
2	Digital Image Processing,2009, S Jayaraman, Tata McGraw Hill
Reference Books	
1	Fundamentals of Digital Image Processing, A K Jain, Prentice Hall, 1988
	Image Processing Principles & Applications 2005, TinkuAcharya&Ajoy K. Ray, Willey Inter-Science
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/37.Digital.Image.Processing.4th.Edition.www.EBooksWorld.ir.pdf
2	Index of /YCCE/DTEL Material/6.Computer Technology/DTEL PPT's with copyrights/DIP
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ee78/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee100/preview

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2356– Lab: Digital Image Processing

Sr. No.	Experiments based on
1	1. Write a program in MATLAB for following Point processing techniques in spatial domain a. Negation of an image b. Thresholding of an image c. Contrast Stretching of an image
2	. Write a Program in MATLAB to Create a Histogram of a given Image OR *https://cse19-iiith.vlabs.ac.in/objective.php?exp=histo*
3	Write a program in MATLAB to perform following smoothing operations on an image a. Average filter b. Ordered Statistics filter
4	. Write a program in MATLAB to sharp an image using Laplacian mask.
5	. Write a program in MATLAB to segment an image using multilevel thresholding OR *https://cse19-iiith.vlabs.ac.in/objective.php?exp=segment*
6	. Write a program in MATLAB to apply split and merge algorithm on a given image.
7	Write a program in MATLAB to find the code chain of a given image.
8	Write a program in MATLAB to find Euler number of image a given image.
9	Write a program using OpenCV tool to detect the object present in an image.
10	Write a program using OpenCV tool to detect and track the object present in video.

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2361– PE II: Blockchain Technology

Course Outcomes:
Upon successful completion of the course the students will be able to

1. Conceptual understanding of how blockchain technology can be used to innovate and improve business processes.
2. Apply cryptographic hash required for blockchain.
3. Apply the concepts of smart contracts for an application.
4. Design a public blockchain using Ethereum.
5. Design a private blockchain using Hyperledger.
6. Use different types of tools for blockchain applications.

Unit:1	Introduction to Block chain	6 Hours

What is a blockchain, Origin of blockchain (cryptographically secure hash functions), Foundation of blockchain: Merkle trees , Components of blockchain, Block in blockchain, Types: Public, Private, and Consortium, Consensus Protocol, Limitations and Challenges of blockchain

Unit:2	Cryptocurrency & Bitcoin blockchain	7 Hours

Cryptocurrency: Cryptocurrency: Bitcoin, Altcoin, and Tokens (Utility and Security), Cryptocurrency wallets: Hot and cold wallets, Cryptocurrency usage, Transactions in Blockchain, UTXO and double spending problem.

Bitcoin blockchain: Consensus in Bitcoin, Proof-of-Work (PoW), Proof-of-Burn (PoB), Proof-of-Stake (PoS), and Proof-of-Elapsed Time (PoET), Life of a miner, Mining difficulty, Mining pool and its methods

Unit:3	Programming for Blockchain & Introduction to Programming	6 Hours

Programming for Blockchain: Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts.

Introduction to Programming: Solidity Programming – Basics, functions, Visibility and Activity Qualifiers, Address and Address Payable, Bytes and Enums, Arrays-Fixed and Dynamic Arrays, Special Arrays-Bytes and strings, Struct, Mapping, Inheritance, Error handling.

Unit:4	Public Blockchain	6 Hours

Introduction to Public Blockchain, Ethereum and its Components, Mining in Ethereum, Ethereum Virtual Machine (EVM), Transaction, Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum . Types of test-networks used in Ethereum, Transferring Ethers using Metamask, Mist Wallet,

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Ethereum frameworks.		
Unit:5	**Private Blockchain**	**7 Hours**
Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT. Introduction to Hyperledger, Tools and Frameworks, Comparison between Hyperledger Fabric & Other Technologies. Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow, Working of Hyperledger Fabric, Creating Hyperledger Network		
Unit :6	**Tools and Applications of Blockchain**	**6 Hours**
Corda, Ripple, Quorum and other Emerging Blockchain Platforms, Blockchain in DeFi: Case Study on any of the Blockchain Platforms.		
Total Lecture Hours		**38 Hours**

Textbooks	
1	Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen Universities Press
2	Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly
Reference Books	
1	Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2	Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna Packet Publishing
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105235
2	https://onlinecourses.nptel.ac.in/noc22_cs44/preview

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester
AIML2362– Lab-PE II: Blockchain Technology

Sr. No	List of practical
1	How to Build Your Own Blockchain Part 1 — Creating, Storing, Syncing, Displaying,
2	How to Build Your Own Blockchain Part 1 — Creating, Storing, Syncing, Displaying, Mining, and Proving Work
3	Develop a full blockchain in javascript.
4	Introduction to web3j, REMIX IDE
5	Intro to Solidity Programming Language - Ethereum Blockchain Developer Tutorial for Beginners
6	Case study of E-voting and write smart contract using Solidity programming
7	Induction to Ganach, Metamask (installation and basics)
8	Develop a simple application and execute using Ganache and Metamask
9	Project – develop a dapp in blockchain.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2363– PE II: Internet of Things

Course Outcomes:
Upon successful completion of the course the students will be able to
1.   Develop various IOT environments
2.   Demonstrate IOT architecture and its enabling technologies
3.   Analyze IOT environments using various communication technologies
4. Apply various IOT enabling technologies for creation of IOT environments

Unit:1	**Introduction**	**5 Hours**
Concepts behind the Internet of Things, Characteristics of IoT, IoT enabling technologies, IoT Communication Model, IoT architecture, Applications of IoT, Transducers, Sensors, Sensor classes, Sensor types, Actuators and its types.		

Unit:2	**IOT Protocols**	**6 Hours**
Application layer: MQTT, COAP, XMPP, AMQP, Network Layer: IPv4, IPv6, 6LoWPAN, IoT Communication protocols: IEEE802.15.4, ZigBee, Wireless HART, Zwave, Bluetooth, NFC, RFID.		

Unit:3	**Wireless Sensor networks**	**7 Hours**
Components of sensor nodes, Node Behavior in WSNs, Applications, WSN Coverage, OGDC algorithm, Stationary and Mobile Wireless Sensor Networks.		

Unit:4	**Cloud Computing**	**6 Hours**
Recent Trends in Computing, Characteristics, Components of Cloud Computing, Service Models, Deployment Models, Service Management, Cloud Security, IoT Data analytics, Case studies, Middleware for IoT		

Unit:5	**Machine to Machine Communication**	**6 Hours**
Node types, IP and Non IP based M2M network Interoperability in Internet of Things: Current Challenges in IoT, Interoperability, Types of Interoperability		

Unit :6	**Software-Defined Networking**	**6 Hours**
Current Network to SDN, SDN Architecture, Challenges, OpenFlow Protocol, APIs in SDN, Controller Placement, Recent Advances of SDN in IoT, Industrial internet of things, Case studies		

Total Lecture Hours		**38 Hours**

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Internet of Things: A Hands-On Approach, Arsheep Bahga, Vijay Madisetti
Reference Books	
1	Introduction to IOT Latest S.Misra , A. Mukherjee, A.Roy
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/21.405352151-Industry-4-0-The-Industrial-Internet-of-Things-Apress-2016.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester
AIML2364– Lab- PE II: Internet of Things

Sr. No.	Experiments based on
1	To study IoT Kit
2	Design a sketch for running of LED's
3	Design a sketch to monitor state of switch by establishing serial communication between Arduino and computer
4	Design a sketch to read analog value of potentiometer by establishing serial communication between arduino and computer
5	Design a sketch for blinking LED's without using delay
6	Design a sketch to develop switch based binary LED counter. Also observe output on serial monitor
7	Design a sketch to create a simple digital clock using LCD display
8	Design a sketch to make use of EEPROM to control devices(LED)
9	To log data of temperature sensor over internet and monitor it from anywhere in the world
10	Use of ESP-32

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester
AIML2365– PE II: Cloud computing

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Explain software and hardware support for enterprise and cloud computing.
2. Perform data modelling for enterprise and cloud knowledge bases.
3. Design enterprise and cloud software applications.
4. Implement and run distributed and cloud applications.
5. Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.

Unit:1	Introduction to Cloud Computing	6 Hours

Defining Cloud Computing; Cloud Types and different models-The NIST model, The Cloud Cube Model, Deployment models, Service models; Examining the Characteristics of Cloud Computing; Benefits of cloud computing; Disadvantages of cloud computing; Assessing the Role of Open Standards.

Unit:2	Cloud Architecture, Services and Applications	6 Hours

Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Saas Vs. Paas, Using PaaS Application Frame works, Software as a Service, Identity as a Service, Compliance as a Service.

Unit:3	Abstraction and Virtualization	6 Hours

Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.

Unit:4	Exploring Cloud Infrastructures	6 Hours

Managing the Cloud-Administrating the Clouds, Management responsibilities, Lifecycle management Cloud Management Products, Emerging Cloud Management Standards, Understanding Service Oriented Architecture- Introducing Service Oriented Architecture.

Unit:5	Managing & Securing the Cloud	6 Hours

Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, the security boundary, Security service boundary, Security mapping, Brokered cloud storage access, Establishing Identity and Presence.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	Advance Clouds and Case Studies	6 Hours
	Cloud Computing Cost Analysis, basic, Selecting an IaaS Provider, Capacity Planning and Disaster, Recovery in Cloud Computing, AWS Cloud architectural principles, basic/core characteristics of deploying and operating in the AWS Cloud, the key services on the AWS Platform and their common use cases, Define the billing, account management, and pricing models, Introduction to Amazon EC2. Case Studies: Microsoft Azure, Dropbox.	

Total Lecture Hours		36 Hours

Textbooks	
1	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Michael Miller, Springer
2	Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc., Rajkumar Buyya, James Broberg, Andrzej Goscinski, A John Wiley & Sons, Inc. Publication

Reference Books	
	Mastering cloud computing, Rajkumar buyya, Christian vecchiola, S Thamarai Selvi, Tata Mc-Graw Hill Education Private Limited
2	Cloud Computing a Practical Approach, Anthony T .Velte, Toby J. Velte, Robert Elsenpeter, Tata Mc-Graw-HILL
3	Cloud computing bible, Barrie sosinsky, Wiley publishing
4	https://cloud.google.com/appengine/docs https://www.chef.io/solutions/cloud-management/ https://aws.amazon.com/documentation https://dev.twitter.com/overview/documentation https://developers.facebook.com/ https://www.cloudfoundry.org/ https://puppet.com/blog/implement-a-message-queue-your-cloud-applicati

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/DTEL%20Material/7.Information%20Technology/DTEL%20PPTs/18.CC%20PPT_ADG.pdf

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2	https://nptel.ac.in/courses/106105167

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester
AIML2366– Lab- PE II: Cloud computing

Sr. No.	List of Experiment
1	To Study Cloud Computing Stack and Different Models of Cloud computing.
2	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
3	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
4	Install Google App Engine. Create hello world app and other simple web applications using python/java.
5	Use GAE launcher to launch the web applications.
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8	Installation and Configuration of Hadoop.
9	Create a word count application using Hadoop Map/Reduce.

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2371– OE III: Introduction to Artificial Intelligence

Course Outcomes:	
Upon successful completion of the course the students will be able to	
1. Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.	

Unit:1	**Introduction to AI**	**6 Hours**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, Representation the AI Problems, Production System		
Unit:2	Knowledge Representation	**6 Hours**
Predicate and propositional logic , Forward and Backward Chaining , Backtracking		
Unit:3	**Local Search Algorithms and Optimization Problems**	**6 Hours**
Local Search in Continuous Space, Searching with Non deterministic actions, Searching with partial observations, online search agents and unknown environments.		
Unit:4	**Adversarial Search & Games**	**6 Hours**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, and Limitations of Game Search Algorithms.		
Unit:5	**Uncertainty in AI**	**6 Hours**
Conditional Reasoning & Bayes Rule, Bayesian Networks, Maximum Likelihood Learning, Maximum A-posterior learning, Markov Decision Processes		
Unit:5	**Introduction to Knowledge**	**6 Hours**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering		
Total Lecture Hours		**36 Hours**

Textbooks	
1	Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Elaine Rich, Kevin Knight, Shivshankar Nair, Artificial Intelligence, McGraw Hill.
Reference Books	

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

1	R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
2	Murray Shanahan: A Circumscriptive Calculus of Events. Artificial. Intelligence 77(2), pp. 249-284, 1995.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Handbook of Artificial Intelligence, Edited By Avronn Barr and Edward Feigenbaum https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf
2	Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs42/

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2372– OE III: Software Testing

Course Outcome
Upon successful completion of this course, the student will be able to: 1. Formulate problem by following Software testing life cycle. 2. Design Manual Test cases for Software Project. 3. Demonstrate utilization of testing automation though testing tool.

Unit No.	Contents	Max. Hrs.
1	**Software Testing Basics:** Basic concepts of Testing: Need of Testing, Basic concepts- errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.	6
2	**Unit Testing:** Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing.	6
3	**Control Flow Testing:** Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage.	7
4	**Integration Testing:** Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration.	7
5	**System Testing:** System Testing: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test.	6
6	**Test Cases:** Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution.	6

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Text Books	
S.No	**Title**
1	Software Testing and Quality Assurance**,** Kshirsagar Naik and PriyadarshiniTripathi**,** Wiley Publication
2	Software Testing Principles, Techniques and Tools**,** M.G. Limaye**,** McGraw Hills

Reference Books	
S.No	**Title**
1	Foundations of Software Testing, Aditya P. Mathur**,** Pearson Education
2	Software Testing Tools**,** Dr. K. V. K. K. Prasad**,** Dream Tech

MOOCs Links and additional reading, learning, video material
1   https://onlinecourses.nptel.ac.in/noc21_cs13/preview
2   https://onlinecourses.nptel.ac.in/noc19_cs71/preview

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AIML2381– OE IV: Introduction to Machine Learning

Course Outcomes:	
Upon successful completion of the course the students will be able to	

2. Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.

Unit:1	**Introduction to AI**	**6 Hours**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, Representation the AI Problems, Production System		
Unit:2	Knowledge Representation	**6 Hours**
Predicate and propositional logic , Forward and Backward Chaining , Backtracking		
Unit:3	**Local Search Algorithms and Optimization Problems**	**6 Hours**
Local Search in Continuous Space, Searching with Non deterministic actions, Searching with partial observations, online search agents and unknown environments.		
Unit:4	**Adversarial Search & Games**	**6 Hours**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, and Limitations of Game Search Algorithms.		
Unit:5	**Uncertainty in AI**	**6 Hours**
Conditional Reasoning & Bayes Rule, Bayesian Networks, Maximum Likelihood Learning, Maximum A-posterior learning, Markov Decision Processes		
Unit:5	**Introduction to Knowledge**	**6 Hours**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering		
Total Lecture Hours		**36 Hours**

Textbooks	
1	Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Elaine Rich, Kevin Knight, Shivshankar Nair, Artificial Intelligence, McGraw Hill.
Reference Books	

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

1	R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
2	Murray Shanahan: A Circumscriptive Calculus of Events. Artificial. Intelligence 77(2), pp. 249-284, 1995.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Handbook of Artificial Intelligence, Edited By Avronn Barr and Edward Feigenbaum https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf
2	Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs42/

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
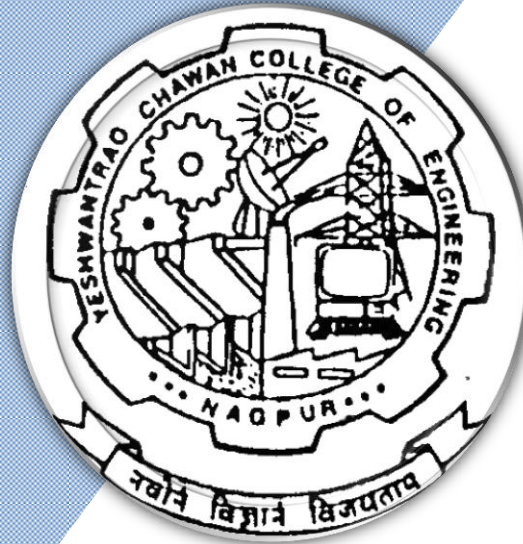**B.Tech SoE and Syllabus 2021 (CSE-AIML)**
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Vl Semester
AIML2382– OE IV: Problem solving Techniques and Statistical methods

Course Outcomes:	
Upon successful completion of the course the students will be able to	
1. Apply Techniques of Problem solving for the solution of mathematical problems.	
2. Solve problems related to Numbers, Sets, and Functions, Induction, Combinatorics.	
3. Define, formulate and solve problems in a systematic manner.	
4. Understand fundamental concepts of data analysis using statistics.	

Unit:1	Introduction	6 Hours
	Numbers, Sets and Functions, Problem Solving Techniques,Language and Proofs, Quantifiers and Logical Statements, Compound Statements, Elementary proof techniques.	

Unit:2	Combinatorics	7 Hours
	Induction, Bijection and Cardinality, Combinatorics,	

Unit:3	Graph	7 Hours
	Counting, Graph Theory, Recurrence Relations	

Unit:4	Basic Statistics	6 Hours
	Sources of Data, Organization of Data, The Histogram, Measures of central tendency, Mean Deviation, Standard Deviation, Correlation, Coefficient of correlation, Rank correlation, Regression.	

Unit:5	Probability	6 Hours
	Equally likely, mutually exclusive events, definitions of probability, additions & multiplication theorems of probability and problems based on them. Bayesian approach, distributions; Poisson, normal, Erlang, Gamma and Weibull probability distributions	

Unit :6	Multivariate Data	6 Hours
	Random Vectors and Matrices, sample estimate of centroid, standard deviation, SSCP, dispersion, variance, covariance, correlation matrices.	

Total Lecture Hours	38 Hours

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Mathematical Thinking-Problem Solving and Proofs. 2nd Edition (2000), JohnP.D'Angelo and Douglas B.,Prentice Hill , West
2	Statistics for Management, Levin R.I. and Rubin D.S., Pearson education
Reference Books	
1	Probability and Statistics , Third edition ,Murray R. Spiegel, John J.Schiller, R AluSrinivasan, Mc Graw Hill education
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/111105077
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VI Semester

AU2130– YCCE Communication Aptitude Preparation (YCAP6.3)

Chairperson	Dean (Acad. Matters)	Dean OBE	July 2022	1.00	Applicable for
			Date of Release	Version	AY 2022-23 Onwards

Bachelor of Technology

SoE & Syllabus 2021

7th & 8th Semester

(Department of Computer Science & Engineering
(CSE)Artificial Intelligence & Machine Learning

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2021-22
(Scheme of Examination w.e.f. 2022-23 onward)
(Department of Computer Science & Engineering)
CSE (AIML)

SoE No. AML-203.1

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Seventh Semester										
1	7	PC	CSE	AIML2401	Computer Vision	T	3	0	0	3	3	30	20	50	3 Hours
2	7	PC	CSE	AIML2402	**Lab:** Computer Vision	P	0	0	2	2	1		60	40	
3	7	PC	CSE	AIML2403	Shallow & Deep Learning	T	3	0	0	3	3	30	20	50	3 Hours
4	7	PC	CSE	AIML2404	**Lab:** Shallow & Deep Learning	P	0	0	2	2	1		60	40	
5	7	HS	CSE	AIML2405	Cyber laws & Ethics in IT	T	3	0	0	3	3	30	20	50	3 Hours
6	7	PE	CSE		**Professional Elective-III**	T	3	0	0	3	3	30	20	50	3 Hours
7	7	PE	CSE		**Professional Elective-IV**	T	3	0	0	3	3	30	20	50	3 Hours
8	7	PE	CSE		**Lab:Professional Elective-IV**	P	0	0	2	2	1		60	40	
9	7	PE	CSE		**Professional Elective-V**	T	3	0	0	3	3	30	20	50	3 Hours
10	7	STR	CSE	AIML2409	Mini Project	P	0	0	4	4	2		100		
11	7	STR	CSE	AIML2410	CRT	P	0	0	0	0	2		100		
					TOTAL SEVENTH SEM		18	0	10	28	25				

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

1	7	PE-III	CSE	AIML2411	PE III: Big Data Analytics										
2	7	PE-III	CSE	AIML2412	PE III:Nature Inspired Computing										
3	7	PE-III	CSE	AIML2413	PE III: Information Retrival System										
4	7	PE-III	CSE	AIML2414	PE III: Data Mining										

Professional Electives -IV

1	7	PE-IV	CSE	AIML2421	PE IV: Cyber Forensic										
	7	PE-IV	CSE	AIML2422	PE IV: **Lab:** Cyber Forensic										
2	7	PE-IV	CSE	AIML2423	PE IV: AI for Medical Domain										
	7	PE-IV	CSE	AIML2424	PE IV: **Lab:** AI for Medical Domain										
3	7	PE-IV	CSE	AIML2425	PE IV: Cognitive System										
	7	PE-IV	CSE	AIML2426	PE IV: **Lab:** Cognitive System										
4	7	PE-IV	CSE	AIML2427	PE IV: Natural Language Processing										
	7	PE-IV	CSE	AIML2428	PE IV: **Lab:** Natural Language Processing										
5	7	PE-IV	CSE	AIML2429	PE IV: Generative AI										
	7	PE-IV	CSE	AIML2430	PE IV: **Lab:** Generative AI										

Professional Electives -V

1	7	PE-V	CSE	AIML2441	PE V: Robotics and its Applications										
2	7	PE-V	CSE	AIML2442	PE V: Augumented / Virtual reality										
3	7	PE-V	CSE	AIML2443	PE V: Game theory										
4	7	PE-V	CSE	AIML2444	PE V: Human Computer Interaction										

SN	Sem	Type	BoS	Sub. Code	Subject	T/P	L	T	P	Hrs	Credits	MSEs*	TA**	ESE	ESE Duration Hours
					Eighth Semester										
1	8	STR		AIML2451	**Major Project**	P	0	0	12	12	9		60	40	
2	8	STR		AIML2452	**Extra Curricular Activity Evaluation**	P	0	0	0	0	1		100		
					TOTAL EIGHTH SEM		0	0	12	12	10				
					GRAND TOTAL		108	0	64	176	151				

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

TA ** = for Theory : 5 marks on lecture quizzes, 11 marks on TA2+TA4 activitied decided by course teacher, 4 marks on class attendance

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

		June 2022	1.01	
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	**Applicable for AY 2022-23 Onwards**

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2401– Computer Vision

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Learn fundamentals of computer vision and its applications

2. Understand the basic image processing operations to enhance, segment the images.

3. Understand the analyzing and extraction of relevant features of the concerned domain problem.

4. Understand and apply the motion concepts and its relevance in real time applications.

5. Apply the knowledge in solving high level vision problems like object recognition, image classification etc.

Unit:1	Overview of computer vision and its applications	5 Hours
Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation	
Unit:2	Image Processing	8 Hours
Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal	
Unit:3	Feature detection	7 Hours
edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations.	
Unit:4	Segmentation	8 Hours
Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut.	
Unit:5	Object Recognition and it's Applications	7 Hours
Object recognition methods, Template matching, Object detection using Haar cascades, Introduction to deep learning for computer vision. Case studies and real-world applications (e.g., facial recognition, object tracking)	
Unit :6	3D Computer Vision	7 Hours
Camera calibration, Stereo vision, Depth perception and disparity maps, Structure from motion, 3D object recognition and reconstruction	
Total Lecture Hours		**Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2	Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/live/FbOCV344iLA?si=IQdy1JM1b4z-Evww
2	

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2402– Lab: Computer Vision

Sr.No	Experiments based on
01	Perform a practical to implement various basic image processing operations in python/matlab/open-CV: Reading image, writing image, conversion of images, and complement of an image
02	Perform a practical to implement contrast adjustment of an image. Implement Histogram processing and equalization.
03	Perform a practical to implement the various low pass and high pass filtering mechanisms.
04	Perform a practical to use of Fourier transform for filtering the image.
05	Utilization of SIFT and HOG features for image analysis.
06	Performing/Implementing image segmentation
07	Perform a practical to implement optical flow computation algorithm
08	Perform a practical to demonstrate the use of optical flow in any image processing application
09	Perform a practical for Object detection and Recognition on available online image datasets
10	Character or digit or face classification project

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2403– Shallow & Deep Learning

Course Outcomes:
Upon successful completion of the course the students will be able to
CO-1: Understand the basic concepts, underlying mathematics, neural network architectures and learning rules
CO-2: Understand , Design and Apply shallow networks for solving classification and regression problems
CO-3: Select suitable model parameters for different shallow and deep learning models.
CO-4: Understand, Design and Apply deep networks for solving real world problems

Unit:1	**Introduction to Biological and Artificial Neural Networks**	6 Hrs
	Necessary mathematics for shallow and deep learning: review of basics of Linear algebra, statistics, and calculus. Biological Neurons, General Artificial Neuron Model, MP Neuron, Neuron activation functions, Perceptron and its types, Neural Network learning Rules, types of neural networks, feedforward vs recurrent neural networks.	
Unit:2	**Perceptron Training and Machine Learning Basics**	6 Hrs
	Single Discrete Perceptron training algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron training algorithm. Machine learning basics: supervised vs unsupervised learning, various Machine learning(ML) tasks like classification, regression, and clustering. Capacity, Overfitting and Underfitting, bias and variance of a ML model.	
Unit:3	**Multilayer Perceptrons and Backpropagation Algorithm**	6 Hrs
	Multilayer Perceptrons (MLPs), Representation Power of MLPs, Feed forward Neural Networks, Backpropagation, algorithm, Momentum Based Gradient Descent (GD), Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.	
Unit:4	**Regularization and MLP applications**	5 Hrs
	L1, L2 Regularization, Early stopping, Dropout regularization, Dataset augmentation, Normalization of inputs. Applications of MLPs for classification and regression, performance measures for classification and regression.	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit:5	**CNN and Autoencoders**	6 Hrs
	History of deep learning, Types of deep networks, Convolutional Neural Networks, Transfer learning using CNNs, Auto encoders, Regularization in auto encoders, Denoising auto encoders, Deep autoencoders.	
Unit :6	**Advanced Deep Learning Architectures**	6 Hrs
	Recurrent Neural Networks(RNN), Long and Short Term Memory Networks(LSTM), Transformer Architecture, Generative Adversarial Networks(GAN), comparison of shallow and deep networks. Deep learning case studies.	

Text books	
1.	Applied Machine Learning, M. Gopal, Mc Graw Hill (second Edition),2022
2.	Deep Learning, Amit Das, Saptarshi Goswami, Prabir Mitra, Amlan Chakrabarti, Pearson
Reference Books	
1.	Pattern Recognition and Machine Learning, Christopher Bishop, 2007
2.	Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016 online eBook at https://www.deeplearningbook.org/
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	Deep Learning – Prof. Mitesh Khapra (IIT Ropar), Swayam Course https://onlinecourses.nptel.ac.in/noc22_cs124/preview
2.	Neural Networks and Deep Learning, Andrew Ng https://www.coursera.org/learn/neural-networks-deep-learning#syllabus

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2404– Lab: Shallow & Deep Learning

(Practical's based on above Syllabus)

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2405– Cyber laws & Ethics in IT

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Understand Cyber laws
2. Describe Information Technology act and Related Legislation.
3. Demonstrate Electronic business and legal issues.
4. Interpret Cyber Ethics.

Unit:1	Introduction to Cyber law	6 Hours
Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, CyberspaceWeb space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.		

Unit:2	Information Technology Act	7 Hours
Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.		

Unit:3	Cyber law and Related Legislation	7 Hours
Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).		

Unit:4	Electronic Business and legal issues	6 Hours
Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.		

Unit:5	Cyber Ethics	7 Hours
The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.		

Unit :6	Treatment of cyber crimes under the IT Act 2008	6 Hours

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Offence and penalties prescribed in I.T Act 2008, Controller's powers with respect to offences And their regulation. Law relating to Cyber crime Under Indian Penal Code (IPC) 1860 Making false electronic record (S.464 IPC) Punishment for forgery (S.465 IPC); forgery of public record etc. (S.466 IPC) and Forgery for purpose of cheating (S.468) Forged document or electronic record (S.470); Using as genuine a forged document or electronic record (S.471); Counterfeiting device or mark used for authenticating documents or electronic record or possessing counterfeit marked material, Falsifying accounts. (S.474 and S.477A).

Total Lecture Hours	**39 Hours**

Textbooks

1	"Cyberlaw: Text and Cases" by Gerald R. Ferrera, Catherine D. Ferrera, and Andrew C. Hess
2	"Cyber Law and Cyber Security in Developing and Emerging Economies" by Babu, N."
3	"Cyber Ethics: Morality and Law in Cyberspace" by Richard A. Spinello

Reference Books

1	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2	Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3	Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi
4	Satyam infoway Ltd. Vs Sifynet solution Pvt. Ltd (2004) 6SCC145

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2	https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2411– PE III: Big Data Analytics

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Understand fundamentals of big data, issues in big data management, big data analytics and its associated applications in intelligent business and scientific computing
2.   Apply machine Learning algorithms for real world data, to provide analytics
3.   Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools
4.   Illustrate the concepts of NoSQL using MongoDB and Cassandra for BigData.

Unit:1	Introduction to Big Data	5 Hours
Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, big data environment terminologies, Big Data Analysis Life Cycle.		

Unit:2	Big data analytics and Analytical methods	8 Hours
Overview of business intelligence, Characteristics and need of big data analytics, Classification of analytics, Challenges to big data analytics. Analytical operations: Associations rules- Apriori algorithm, classifications-decision trees, naïve bayes clustering- K means.		

Unit:3	Hadoop foundation for analytics	6 Hours
Features, key advantages of Hadoop , key aspects of Hadoop, versions of Hadoop , Hadoop ecosystem ,and Components, HDFS, HBase, Hadoop Technology Stack: Hive, Pig, Zookeeper, Swoop, oozie, flume, etc. Hadoop distributions, Hadoop vs SQL		

Unit:4	MapReduce and YARN framework	6 Hours
Introduction to MapReduce, Processing data with MapReduce, map reduce example, Introduction to YARN, YARN architecture , Data serialization and common serialization formats, Big data serialization formats.		

Unit:5	NoSQL Databases	5 Hours
Introduction to NoSQL, advantages of NoSQL, SQL vs NoSQL, types of NoSQL databases- Schema-less Models‖: Increasing Flexibility for Data Manipulation-KeyValue Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases , Hive -- Sharding –- Hbase		

Unit :6	Introduction to MongoDB key features	6 Hours
Introduction to MongoDB key features, data types in MongoDB, MongoDB Query Language.: update remove, insert methods, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document searching, Constructing queries on Databases, documents		

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Total Lecture Hours		**36 Hours**
Textbooks		
1	Big Data and Analytics ,Seema Acharya, Subhashini Chhellappan , Willey 2nd edition	
2	Professional Hadoop Solutions, Boris lublinsky, Kevin T.Smith, Alexey Yakubovich ,Wiley ISBN: 978-1-118-61193-7 September 2013	
3	Understanding Big data , Chris Eaton,Dirk derooset al. , McGraw Hill	
4	BIG Data and Analytics ,Sima Acharya, Subhashini Chhellappan , Willey	
Reference Books		
1	MongoDB in Action , Kyle Banker, Piter Bakkum, Shaun Verch, Dream tech Press	
2	Big Data Analytics with R and Hadoop , Vignesh Prajapati, Packet Publishing	
3	Tom White, HADOOP: The definitive Guide, O Reilly, 2012	
4	Learning Spark: Lightning-Fast Big Data Analysis Paperback , Holden Karau	
MOOCs Links and additional reading, learning, video material		
1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview		

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2412– PE III: Nature Inspired Computing

Course Outcomes:
Upon successful completion of the course the students will be able to   1. Understand the principles and theoretical foundations of nature-inspired computing.   2. Develop a working knowledge of the major nature-inspired computing techniques and algorithms.   3. Explore the applications of nature-inspired computing in various problem domains.   4. Gain hands-on experience in implementing and evaluating nature-inspired computing algorithms.   5. Develop critical thinking and problem-solving skills through analyzing and discussing research papers

Unit:1	Introduction to Nature-Inspired Computing	6 Hours
	History, Major tasks, Natural paradigms, Cellular automata :Dynamical systems, simulation,Self-replication, Comparison with traditional computation paradigms.	

Unit:2	Evolutionary Computing	6 Hours
	Background and history of evolutionary computation (EC), Different branches of EC: GA, GP, EA, EP, DE, Selected applications of EC methods	

Unit:3	Neural Networks, Deep Learning	6 Hours
	Neural Networks : Background and history of artificial neural networks (ANNs), Learning algorithms based on ANNs, Optimization with ANNs, Selected applications of ANNs	

Unit:4	Swarm Intelligence	6 Hours
	Swarm Intelligence :Background and history of collective and swarm intelligence, Examples of swarm intelligence in biology, Mechanisms of swarm behaviour (such as recruitment, quorum sensing), Selected application of swarm methods, Ant Colony Optimization and other swarm-based algorithms	

Unit:5	Artificial Immune Systems	6 Hours
	Immune system functioning and principles, Immune-inspired algorithms: clonal selection, negative selection, and immune network algorithms, Applications in anomaly detection, optimization, and pattern recognition	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	Applications of Nature-Inspired Computing	6 Hours
	Engineering design optimization, Financial forecasting and portfolio optimization, Image and signal processing, Data mining and pattern recognition	
Total Lecture Hours		**36 Hours**

Textbooks	
	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
1	Kazumi Nakamatsu, Srikanta Patnaik, Xin-She Yang "Nature-Inspired Computing and Optimization Theory and Applications".
2	Himansu Das, Jitendra Kumar Rout, Minakhi Rout ,"Nature Inspired Computing for Data Science".
Reference Books	
1	Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
2	3. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006. 4. Marco Dorrigo,
3	Thomas Stutzle," Ant Colony Optimization", PHI,2005
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
2	
MOOCs Links and additional reading, learning, video material	
1	
2	

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2413– PE III: Information Retrieval System

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Understand different Information retrieval models.
2. Know about evaluation methods of the information retrieval model.
3.   3. Know the challenges associated with each topic

Unit:1	Introduction to Information retrieval	7 Hours
	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	

Unit:2	Tolerant Retrieval	7 Hours
	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.	

Unit:3	Evaluation	7 Hours
	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.	

Unit:4	Query Expansion	6 Hours
	Query Expansion : Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift **Probabilistic Information Retrieval**: Probabilistic relevance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval	

Unit:5	XML Indexing and Search	6 Hours
	XML Indexing and Search: Data vs. Text-centric XML, Text-Centric XML retrieval, Structural terms.	

Unit :6	Web Information Retrieval	6 Hours
	Web Information Retrieval Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS.	

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Total Lecture Hours	**39 Hours**

Textbooks	
1	Introduction to Information Retrieval , Christopher D. Manning, Raghavan and Schutze, Cambridge University Press,2008

Reference Books	
1	Natural Language Processing And Information Retrieval, Tanveer Siddiqui and U. S. Tiwary, Oxford Higher Education,2008**,** Royce**,** Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material	
1	https://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html
2	https://cse.iitk.ac.in/pages/CS657.html

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2414– PE III: Data Mining

Course Outcomes:
Upon successful completion of the course the students will be able to
CO-1: Define and explain fundamental concepts in data mining
CO-2 Apply various data mining techniques, including decision trees, neural networks, clustering algorithms, and association rule mining algorithms.
CO-3: Evaluate and validate the results of data mining models, considering factors like accuracy, precision, recall, and F1-score.
CO-4: Apply data mining techniques to real-world datasets and scenarios, solving practical problems and making informed decisions.
CO-5- Gain practical experience using data mining tools such as WEKA, R or other relevant software.

Unit:1	**Introduction to Data Mining**	6 Hrs
	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.	
Unit:2	**Association Rule Mining**	7 Hrs
	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.	
Unit:3	**Classification and prediction**	7 Hrs
	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, Bayes classifier ,K- nearest Neighbour , prediction using Linear regression, Logistic regression	
Unit:4	**Cluster Analysis**	7 Hrs
	What is cluster analysis, its applications, clustering paradigms, Partioning algorithms: K- means,K-medoids, Hierarchial clustering: Agglomerative and Divisive hierarchical clustering, DBSCAN	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

algorithm ,Outlier Detection,		
Unit:5	**Web Mining**	7Hrs
Introduction, web content mining, web structure mining, web usage mining, mining multimedia data on web.		
Unit :6	**Text mining:**	7Hrs
Text data analysis and Information retrieval, Unstructured texts, text mining approaches, episode rule discovery for texts, Hierarchy of categories, text clustering		

Text books	
1.	Data Mining: Concepts and Techniques, Pei, Han and Kamber, Elsevier, 2011
2.	Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016
Reference Books	
1.	Data mining methods and models second reprint,2007 Daniel Larose Wiley Interscience
2.	Data mining techniques 2nd edition Arun Pujari University press,(India) 2010
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://link.springer.com/book/10.1007/978-3-319-14142-8
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9781118950951
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs06/preview

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2421– PE IV: Cyber Forensic

Course Outcomes:
Upon successful completion of the course the students will be able to
1.   Investigate hardware parts of a computer system for evidences
2.   Use different tools for data acquisition and duplication for forensic study
3.   Securely store data and evidence collected
4.   Create report of forensic investigation made

Unit:1	Introduction	8 Hours

Types of Cyber Crime, Security Attacks, Overview of computer forensics in today's world, computer hardware basics, Computer forensics investigation process, understanding hard disks and file systems, Types of computer forensics.

Unit:2	Computer Forensic	8Hours

Computer forensic: Data acquisition and duplication, defeating anti-forensics techniques, operating system forensics, Log analysis and event viewer, File auditing, identifying rogue machines, Malware forensic Database forensic.

Unit:3	IT Fraud	7 Hours

IT fraud, Recovery of deleted files, Live Data collection and investigating Linux environment. Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), email crimes.

Unit:4	Network Forensics	8 Hours

Network forensics, investigating web attacks, Gathering Tools to create a response toolkit. Hidden files and unauthorized access points. Analyzing network traffic, Sniffers Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc.

Unit:5	Mobile Forensics	7 Hours

Mobile Forensics, Live Data collection and investigating on android, ios, windows environment, Investigating report generation, investigation process, acquisition types, tools, report generation

Unit :6	Case Studies	7 Hours

Forensics report writing and presentation, Case studies

Total Lecture Hours	**45 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Incident Response & Computer Forensics, Second, Mandia, K., Prosise, C., Pepe, M., Tata-McGraw Hill
2	Guide to Computer Forensics and Investigations, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning
Reference Books	
1	File System Forensic Analysis, Brian Carrier, Wesley
2	Digital Evidence and Computer Crime, Eoghan Casey, Academic Press
3	Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, Syngress Publication
4	EnCE: The Official EnCase Certified Examiner Study Guide, Steve Bunting, Sybex Publication
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/41-Introductory%20Computer%20%20Forensics.pdf
MOOCs Links and additional reading, learning, video material	
1	Cyber Security and Cyber Forensics (cdac.in)
2	https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2422– Lab: PE IV: Cyber Forensic

Sr. No.	Experiments based on
1	Study practical on cyber-crime and generation of Hash values on file system
2	Perform data accusation and imaging on digital evidences
3	Perform recovery and data carving on digital evidence
4	Explore and analyses tools on Email analysis an investigation
5	Password recovery tools, from RAR, DOC, PDF, windows password
6	Mobile forensics SIM card analysis
7	Mobile data Analysis

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2423– PE IV: AI for Medical Domain

Course Outcomes:		
Upon successful completion of the course the students will be able to		
1. Understand what is Artificial Intelligence (AI) and Machine learning (ML)		
2. Understand the concept of Internet of Things (IoT) and its applications in healthcare		
3. Analyze the healthcare data and process it using data analysis and statistical tools		
4. Explore the applications of AI and ML with respect to healthcare domain		
Unit:1	**Introduction**	**7Hours**
Introduction to Artificial Intelligence (AI), Overview of techniques and applications,Artificial neural networks,Supervised, semi-, and non-supervised learning,Pattern recognition,Interactive process mining,Tools and real-world examples, Importance and Applications of AI and ML in Healthcare		
Unit:2	**Types of Machine Learning and its classification**	**4 Hours**
Traditional machine learning methods,Decision Tree, Bayesian Classifier, Regression		
Unit:3	**Neural Networks, their types, and processing**	**7 Hours**
Neural Networks – learning Models,Deep Neural Network, Convolution Neural Networks & Recurrent Neural Networks , Natural Language Processing , Commonly Used and Advanced Neural Network architectures,Computer Vision		
Unit:4	**Internet of Things (IoT)**	**5 Hours**
Introduction ,Process flow and Tools, Use Cases,Remote Patient Monitoring		
Unit:5	**Data Representation**	**7 Hours**
Data Representation: Introduction to data, data frames ,Data standardization, Dealing with noise and missing values ,Transforming and normalizing data		
Unit :6	**Data Analytics and Data Analysis**	**8 Hours**
Overview of tools like R, Python ,Statistical and Visualization tools,Sources of the healthcare data ,Pre-processing of the healthcare data ,Handling of the healthcare data ,Creation of analysis-ready datasets		
Total Lecture Hours		**39 Hours**
Textbooks		
1	Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence 3	
2	Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press.	

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Reference Books	
1	Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning, Springer
2	Adam Gibson, Josh Patterson, Deep Learning, O'Reilly Media, Inc.
3	Guoguang Rong, Arnaldo Mendez, Elie Bou Assi, Bo Zhao, Mohamad Sawan, Artificial Intelligence in Healthcare: Review and Prediction Case Studies, Engineering, Volume 6, Issue 3, 2020, Pages 291-301, ISSN 2095-8099, https://doi.org/10.1016/j.eng.2019.08.015.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	
2	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2424– Lab: PE IV: AI for Medical Domain

(Practical's based on above Syllabus)

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2425– PE IV: Cognitive System

Course Outcomes:
Upon successful completion of the course the students will be able to:
1. To understand the way in which cognitive science is methodologically distinctive while at the same time is an interdisciplinary field where established fields of research—including Psychology, Computer Science, Linguistics, Neuroscience.
2. To develop skills in analyzing, interpreting, and assessing the empirical data and research techniques that contribute to cognitive science.
3. To understand central modeling techniques in cognitive science, including traditional computational approaches, neural network/deep learning approaches, and dynamical approaches.

Unit:1	Introduction to Cognitive Science	7 Hours
Introduction to the study of cognitive sciences. Neural Network Models- language: definition Affordances Categories and concepts; Concept learning: Linguistic knowledge: Syntax, semantics, (and pragmatics) Direct perception, Logic; Machine learning.		

Unit:2	Concept Hierarchies	7 Hours
A brief history of cognitive science. Processing of sensory information in the brain, Linguistic knowledge: Syntax, semantics, (and pragmatics), Ecological Psychology, constructing memories Methodological concerns in philosophy, Discretization and generating concept hierarchies, Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory		

Unit:3	Anatomy of brain	7 Hours
Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory Structure and constituents of the brain fMRI, MEG, Language disorders, Development Information processing (three-boxes) model of memory.		

Unit:4	Memory Models	5 Hours
Brief history of neuroscience, PET, EEG Lateralization Child and robotic development Sensory memory; Short term memory Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, long term memory; Rationality		

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit:5	Sensory Information fusion and Modelling	7 Hours
Mathematical models Information fusion, the great past tense debate, Human visual attention, Bounded rationality; Prospect theory; Heuristics and biases Looking at brain signals. Computational models of attention, Reasoning in computers, Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition		
Unit :6	Information processing	6 Hours
Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional Context and social judgment; Schemas; Social signals		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Pradeep KumarMallick, Samarjeet Borah," Emerging Trends and Applications in Cognitive Computing", 2019, IGI Global Publishers
2	Masood, Adnan, Hashmi, Adnan ,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow, 2015
Reference Books	
1	Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind", 2020 Cambridge University Press, New York.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
2	
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/109103134
2	https://onlinecourses.nptel.ac.in/noc20_hs29/preview
3	https://onlinecourses.nptel.ac.in/noc22_ee122/preview

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2426– Lab: PE IV: Cognitive System

(Practical's based on above Syllabus)

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2427– PE IV: Natural Language Processing

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Model linguistic phenomena with formal grammars. 2. Design, implement and test algorithms for NLP problems 3. Apply NLP techniques to design real world NLP applications 4.Develop useful systems for language processing and related tasks involving text processing		
Unit:1	**Introduction to NLP**	**5 Hours**
Introduction, History of NLP, Generic NLP system, levels of NLP , Knowledge in language processing , Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP.		
Unit:2	**Morphology**	**8 Hours**
Morphology fundamentals, Morphological Diversity of Indian Languages, Morphology Paradigms, Shallow Parsing, Named Entities, Maximum Entropy Models, Random Fields. Word Level Analysis, Morphology analysis –survey of English and Indian language Morphology, Inflectional morphology & Derivational morphology, Lemmatization, Regular expression, finite automata, finite state transducers (FST) ,Morphological parsing with FST , Lexicon free FST Porter stemmer. N –Grams- N-gram language model, N-gram for spelling correction.		
Unit:3	**Parsing**	**7 Hours**
Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents, Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution, Dependency Parsing, Distributional Semantics.		
Unit:4	**Semantic & Lexical Analysis**	**8 Hours**
Meaning : Lexical Knowledge Networks, Wordnet Theory, Indian Language Wordnets and Multilingual Dictionaries, Semantic Roles, Word Sense Disambiguation, WSD and Multilinguality Semantic Analysis: Lexical Semantics, Attachment for fragment of English- sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, Robust Word Sense Disambiguation (WSD), Dictionary based approach.		
Unit:5	**NLP Operations**	7 Hours
Information Extraction, Relation Extraction, Text Summarization, Text Classification, Entity Linking, Syntax and Grammar Analysis		

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	NLP Applications	7 Hours
Natural language Processing applications (preferably for Indian regional languages) : Sentiment Analysis, Text Entailment, Robust and Scalable Machine Translation, Question Answering in Multilingual Setting, Cross Lingual Information Retrieval (CLIR).		

Total Lecture Hours	Hours

Textbooks	
1	Jurafsky, Daniel, and James H. Martin, Speech and Language Processing:An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, PrenticeHall, 2000.
2	Christopher D. Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing. Cambridge, MIT Press, 1999.
3	Speech and Language Processing: An Introduction to Natural Language Processing by Dan Jurafsky and James Martin,3rd Edition, Pearson Publication

Reference Books	
1	James Allen, Natural Language Understanding, Benjamin/Cummings, 2ed, 1995.
2	Eugene Charniak, Statistical Language Learning, MIT Press, 1996.
3	Martin Atkinson, David Britain, Harald Clahsen, Andrew Redford, Linguistics, Cambridge University Press, 1999.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106101007
2	https://onlinecourses.nptel.ac.in/noc22_cs98/preview

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2428– Lab: PE IV: Natural Language Processing

Sr.No	Experiments based on
01	Program should be based on Natural Language Understanding (Lexical Ambiguity, Syntactical Ambiguity, Referential Ambiguity)
02	Study and understand the BERT Model
03	Perform a program based on Errors Detection and Corrections
04	Program should be based on Sentence Framing
05	Perform a program based on Part-of-Speech (POS) Tagging
06	Perform a program based on Lexical Semantics
07	Perform a program based on Dependency Parsing
08	Perform a program based on NLP Applications

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2441– PE V: Robotics and its Applications

Course Outcome
Upon completion of the course the students will be able to
1. Interpret terminologies related to Robotics technology.
2. Understand various grippers and sensors for robotics and Analyze basics of principles of robot system integration.
3. Integrate knowledge of AI techniques in the area of robotic technology.
4. Apply robotics concept to automate the monotonous and hazardous tasks and categorize various types of robots based on the design and applications in real world scenarios.

Unit No.	Contents	Max Hrs.
1	**Introduction to Robotics :**	7
	Brief History, Basic Concepts of Robotics such as Definition , Three laws,Elements of Robotic Systems i.e. Robot anatomy, DOF, Misunderstood devices etc., Classification of Robotic systems on the basis of various parameters such as work volume, type of drive, etc., Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device etc., Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.	
2	**Grippers and Sensors for Robotics:**	6
	Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.	
3	**Drives and Control for Robotics:**	6
	Drive - Types of Drives, Types of transmission systems,Actuators and its selection while designing a robot system. Control Systems: Types of Controllers, Introduction to closed loop control	
4	**Programming and Languages for Robotics:**	7
	Robot Programming: Methods of robot programming,WAIT, SIGNAL and DELAY commands, subroutines, Programming Languages: Generations of Robotic Languages, Introduction to various types such as VAL, RAIL, AML, Python, ROS etc., Development of languages since WAVE till ROS.	
5	**Related Topics in Robotics:**	6
	Socio-Economic aspect of robotisation. Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need andapplication of AI, New trends & recent updates in robotics	

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

6	**Robotics Applications:**	7
	Material Handling: pick and place, palletizing and depalletizing, machining loading and unloading, welding & assembly, Medical, agricultural and space applications, unmanned vehicles: ground, Ariel and underwater applications, robotic for computer integrated manufacturing. Types of robots: Manipulator, Legged robot, wheeled robot, aerial robots, Industrial robots, Humanoids, Robots, Autonomous robots, and Swarm robots	
	Total Lectures	

Text Books	
1	S. K. Saha, Introduction to Robotics 2e, TATA McGraw Hills, Education (2014)
2	Dilip Kumar Pratihar Fundamentals of Robotics Narosa Publishing House
3	Asitava Ghoshal, Robotics: Fundamental concepts and analysis, Oxford University Press

Reference Books	
1	S. B. Niku, Introduction to Robotics – Analysis Contro, Applications John, Wiley & Sons Ltd., (2020)
2	J. Angeles Fundamentals of Robotic Mechanical Systems Theory Methods and Algorithms Springer (1997).

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://roboticscasual.com/robotics-tutorials/
2	https://www.ieee-ras.org/educational-resources-outreach/educational-material-in-robotics-and-automation
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ge20/preview

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2442– PE V: Augmented & Virtual Reality

Course Outcome
Upon completion of the course the students will be able to
1. Understand the basic concepts of Virtual and Augmented Reality
2. Identify the differences in AR/VR concepts and technologies
3. Understand the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
4. Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
5. Design and prototype effective AR/VR applications using UNITY platform for business, industry, non-profit and government organizations

Unit No.	Contents	Max Hrs.
1	**Introduction to Augmented Reality (AR)**	6
	Definition and Scope, A Brief History of Augmented Reality , Displays (Multimodal Displays, Spatial Display Model, and Visual Displays), Strong vs Weak AR, Applications of AR, Challenges in AR	
2	**Introduction to Virtual Reality (VR)**	6
	Definition and Scope, Types of VR, Characteristics of VR, Basic VR environments, Limitations of VR environments, Immersion Vs Presence, Key hardware requirements for VR	
3	**Interaction design for AR/VR Environments**	6
	Interaction design process, Identifying user needs, AR/VR design considerations, Typical AR/VR Interface Metaphors, Affordances in AR/VR, Human Information Processing.	
4	**AR/VR and UNITY**	7
	Design for Perception and cognition, User experience(UX) guidelines for AR/VR UX challenges for AR/VR, Prototyping for AR/VR, Evaluation of the developed AR/VR prototype. Unity Overview: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects	
5	**Introduction to UNITY**	6
	Asset Store, Importing Plug-ins, Creating a Terrain, Materials, Colors, Transparency Introduction to Monobehaviors: Awake, Start, Update	
6	**Introduction to Vuforia and Physics in UNITY**	7
	Vuforia Overview: Interface, Navigation, Terminology, Image Targeting, Custom Images Overview of Physics in Unity, Introduction to Scripting: Terminology, Creating Objects, Accessing Components, Debugging, Lists, Loops	
	Total Lectures	38

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Text Books	
1	Sherman, W. R., & Craig, A. B. (2003). Understanding virtual reality. San Francisco, CA: Morgan Kauffman.
2	Schmalstieg, D., & Hollerer, T. (2016). Augmented reality: principles and practice. Addison-Wesley Professional.

Reference Books	
1	http://lavalle.pl/vr/book.html

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1. http://lavalle.pl/vr/book.html

MOOCs Links and additional reading, learning, video material

https://nptel.ac.in/courses/106/106/106106138/

https://www.coursera.org/learn/introduction-virtual-reality

https://www.youtube.com/watch?v=MGuSTAqlZ9Q

https://www.udemy.com/course/fundamentals-of-augmented-reality-virtual-reality-101-ar-vr/

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2443– PE V: Game Theory

Course Outcomes:	
Upon successful completion of the course the students will be able to	
1. Identify areas where game theory is applicable 2. Implement different principals of game theory 3. Find the various theorems by Analyzing game theory 4. Develop real life applications using game theory	

Unit:1	Introduction to Game Theory	6 Hours
Elements of Game theory, examples, Strategic Games, 2 Player Strategy Games, payoffs, Minimax, Weak and Strong Domination, Saddle Points, Nash Equilibrium, Prisoner's Dilemma, Stag Hunt, Matching pennies, BOS, Multi NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE		

Unit:2	Principles of Game Theory	7 Hours
Combinatorial games, Winning and losing positions, Subtraction Game, 3-Pile and K-Pile Games, Proof of Correctness, Variations of K-Pile Games, Graph Games, Construction, Proof of finiteness, SG theorem for sum of games.		

Unit:3	Theorems of Game Theory	7 Hours
Cournot's Oligopoly, Bertrand's Oligopoly, Electoral Competition, Median Voter Theorem, Auctions, role of knowledge, Decision making and Utility Theory, Mixed Strategy Equilibrium, Stackelberg's model of Duopoly, Buying Votes, Committee Decision making, Repeated Games, Prisoner's Dilemma, Supermodular Game and Potential games		

Unit:4	Extensive form games: perfect information	6 Hours
Game trees and extensive forms, Reduced form and Nash equilibrium, Backward induction and subgame perfect equilibrium, Stackelberg's model of Duopoly, Buying Votes, Mixed and behavior strategies, Alternating offers bargaining		

Unit:5	Extensive form games: incomplete information	6 Hours
Perfect Bayesian equilibrium, Sequential equilibrium		

Unit :6	Auction and Mechanism Design with Applications	6 Hours
Revenue Equivalence, Risk Averse Bidders, Asymmetries among Bidders, Optimal Mechanism, Bargaining in Wireless Network, Efficient Mechanism: Vickrey-Clarke-Groves Auction, Dynamic Spectrum Auction in Cognitive Radio Networks.		

Total Lecture Hours	38 Hours

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Textbooks	
1	Game Theory by Michael Maschler, Eilon Solan, and Shmuel Zamir.
2	Game Theory by Fudenberg, Drew, and Jean Tirole.. MIT Press
Reference Books	
1	An Introduction to Game Theory by Martin Osborne, Oxford University Press
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc19_ge32/preview
2	https://archive.nptel.ac.in › courses

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester

AIML2444– PE V: Human Computer Interaction

Course Outcomes:
Upon successful completion of the course the students will be able to
1) Understand the basics of Human Computer Interaction.
2) Demonstrate the Understanding of Interaction between human and computer Components using screen designing concepts.
3) Apply the knowledge of human and computer components for interaction.
4) Evaluate System using different tools and techniques.

Unit:1	Introduction	7 Hours

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, menus, pointers) interface interactivity, The context of the interaction, paradigms for interaction.

Unit:2	Interaction Design	7 Hours

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.

Unit:3	HCI	6 Hours

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.

Unit:4	Implementation and Evaluation	7 Hours

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.

Unit:5	Universal Design	6 Hours

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.

			July 2022	1.00	Applicable for
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

Unit :6	Cognitive Models	6 Hours
Cognitive Models and Distributed Cognition: Goal and task hierarchies, Linguistics models, Challenges of display-based systems, Physical models, Cognitive architectures, Scientific Foundation, Description, Case Study.		

Total Lecture Hours	39 Hours

Textbooks

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

1	Interaction Design, Preece and Rogers, Sharp, Wiley-India, 2008.
2	The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech, 2009

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/25.BOOK1-Human_computer_interaction.pdf

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc19_cs86/preview

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2409– Mini Project

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VII Semester
AIML2410– CRT

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VIII SEMESTER

AIML2451 – Major 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 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.

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.Tech SoE and Syllabus 2021 (CSE-AIML)
(Department of Computer Science and Engineering)
CSE-Artificial Intelligence & Machine Learning (CSE AIML)

VIII SEMESTER

AIML2452 - 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.

			July 2022	1.00	Applicable for
					AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	