NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS &

MANAGEMENT STUDIES (AUTONOMOUS)

Re-accredited by NAAC with 'A' Grade (3rd Cycle)

ISO 9001:2015 Certified

Bhavishya Bharat Campus, S. V. Road, Malad (West) Mumbai-
400 064

Proposal for

Master of Science Computer Science

(Specialization in Artificial Intelligence)

Two Year Integrated Programme

**Four Semesters
Course Structure**

Under Choice Based Credit, Grading and Semester System

Implemented during Academic Year – 2021-2022

About Khandwala College

Khandwala College is a multi-faculty institution (Estd. 1983), affiliated to University of Mumbai. It offers 23 UG, 7 PG, 4 Add On, 3 Ph. D with 9 Departments and 2 Research Centres imparting education to more than 6500 students. The Vision of the institute includes Education for all, Education for the youth and Education for the future of our country. The Mission is to serve the society at large and students belonging to linguistic minority in particular with commitment, dedication and devotion. The Quality Policy includes commitment towards imparting Quality Education to youth, enabling them to develop the right attitude, professional competence and inculcating right ethical values.

The institution has been awarded "A" Grade (Third Cycle) by National Assessment and Accreditation Council, Best College by University of Mumbai (2012), lead college for a cluster of colleges, Educational Excellence Award by Indus Foundation, USA and Best Ensemble Faculty (Academic Brilliance Awards – 2013) by Education Expo TV's Research Wing for Excellence in Professional Education & Industry and ISO 9001:2015 certified by TUV Nord. We have been awarded IMC Ramkrishna Bajaj National Quality Commendation Certificate in 2013-14. Our college has been awarded Autonomous status from 2016.

1.1 Vision and Mission of Khandwala College

Vision
Education for all
Education for the youth
Education for the future of our country

Mission
The college's focus is on the future of our students irrespective of their gender and place in society. Every student is like a flame reaching out to the brightness of the sun i.e. the bright future of India

Program Objectives:

The M.Sc (specialization in Artificial Intelligence) has been designed to cater to the regional, national and global requirements to build expertise in the area of Artificial Intelligence. Further, the graduate will able to articulate and solve the problems in the related fields and can take up interdisciplinary projects as well. The objective is to prepare entrepreneurs and workforce for the public and private sector in the related areas.

Program Educational Objectives (PEO):

1. To prepare the post graduates as leading professionals in government, academia, corporate, and research organizations along with entrepreneurial pursuits.
2. To prepare post graduates with an ability to articulate and solve problems using different Artificial Intelligence Techniques and tools.
3. To prepare the post graduates with strong learning quotients having adaptability to the constantly changing technological environment with strong knowledge in Artificial Intelligence.
4. To prepare the post graduates to lead and initiate ethically the professional and organizational goal in the area of Artificial Intelligence and develop innovative and research-oriented methodology to solve the complex problems.

Program Outcomes (PO):

The main outcomes of this program are given here. At the end of the program a student is expected to have:

1. **Abilities**: An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.
2. **Modern Tool Usage**: Create, select and apply appropriate techniques, resources and IT tools (Python Programming, R Studio, PyCharm, Jupiter Notebook) to solve real world problem.
3. **Real World Challenge**s: An ability to design, develop and evaluate AI solutions for novel applications which meet the desired needs of industry and society.
4. **Communication Efficacy**: Communicate effectively with all the stack holders as well as society by being able to comprehend effective documentations and presentations.
5. **Individual & Team Work:** Ability to work in diverse teams and also as an individual in multidisciplinary environment.
6. **Research skills**: An ability to undertake original research at the cutting edge of computer science & its related areas.
7. **Innovation**: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

8.	**Project Management and Finance**: Ability to understand, management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
9.	**Professional skills:** Collaborative skills, ability to write grants & articles for journals and sit in for various competitive and professional certifications in the field of Computer Science and (data science/ information security/ cloud computing/ mobile application).
10.	**Professional Ethics**: An understanding of professional and ethical responsibility.
11.	**Life-long Learning**: An ability to learn independently and engage in life- long learning.

Program Specific Outcomes (PSOs):

PSO1	Students will be able to demonstrate the ability to solve complex problems of development in the field of Artificial Intelligence, and the core issues of Machine Learning and Natural language processing by analysing, formulating sub-tasks, and proposing innovative solutions.
PSO2	Students will be able to work with various technologies like digital image processing, sensor technology, Robotic process automation and moreover they will also be able to provide the appropriate AI solutions and make recommendations as per the use case.
PSO3	Students will be able to apply creative and innovative techniques to identify the issues and develop Mobile Applications that requires Chatbots, Machine Learning, Deep learning, etc.
PSO4	Students will be able to develop Artificially Intelligent Applications using different tools and technologies.

PEO-PO-PSO mapping

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3	PSO 4
PEO 1	H	M	M	M	M	H	M	L	M	M	M	H	H	H	M
PEO 2	H	H	H	H	M	H	H	H	M	H	M	H	H	H	H
PEO 3	M	H	H	H	M	L	M	M	L	H	H	M	H	M	H

PEO 4	M	M	L	M	H	M	H	M	H	M	H	H	M	H	M

*Note: H – Higher, M- Medium, L- Low

Eligibility, Selection and Admission Criterion

Candidates for being eligible for admission to the two-year course leading to the Degree of Master of Science Computer Science (Specialization in Artificial Intelligence), shall be required to have passed the B. Sc./BE/B. Tech. / BCA/ BCS or an equivalent qualification in Science stream from a recognized University.

Eligibility Criterion:

The student must be a graduate with B. Sc./BE/B. Tech. / BCA/ BCS or equivalent, from a recognized University with more than 55% . Lateral Entry shall be applicable for students who have pursued similar or related Programmes from any University. Eligibility Criteria shall be applicable for lateral entry.

Selection and Admission Criterion for Eligible Candidates:
The interested students shall register for Aptitude Test, Group Discussion, and Personal Interview.
Reservations as per University rules will be applicable.

The admission of students shall be based on:

- Academic and non- academic credentials till date
- Performance in Aptitude Test [comprising of questions in Mathematics/Statistics, English, Logical Reasoning, Analytical Ability] and Performance in Personal Interview
- The candidate has to fulfil all the prescribed admission requirements / norms of the College
- In all matters relating to admission to the programme the decision of the Management of institute/college shall be final
- At any time after admission, if found that a candidate has not fulfilled one or many of the requirements stipulated by the Institute, or submitted forged certificates, the Institute has the right to revoke the admission and will forfeit the fee paid. In addition, legal action may be taken against the candidate as decided by the Management of institute/college

Eligibility for the award of the Degree
- A candidate shall be eligible for the award of the Degree only if he/she has undergone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the Six Semesters earning 104 credits, and letter grade of at least D or above (i.e. O/ A+/A/ B+/B/C/D) in core.
- No dues to the College, Libraries etc.; and
- No disciplinary action is pending against him / her.

Faculty under which the Degree is awarded

Master of Science Computer Science (Specialization in Artificial Intelligence) Programme is awarded under Faculty of Science.

Intake and Fees

Intake of 20 Students in the first year with an additional division of 20 students from the second year onwards. Additional 15% shall be permitted to make provision for any cancellation of Admissions. Additional admissions to the extent of 15% will be permitted for foreign students every year.

Programme Fees for each Semester - Rs. 97,500/- . The fees can be increased by 12% every year.

Attendance

- A student has to obtain a minimum 75% cumulative attendance for the theory lectures, practical and tutorial (wherever prescribed) separately will be required out of the total number of lectures, practical and tutorials on the subject conducted in the term.
- 25% allowance in attendance is given to account for activities under NCC / NSS / Cultural / Sports / Minor Medical conditions etc.
- A student with a cumulative attendance of less than 75%, will not be permitted to appear for the end semester examination for all the courses in that semester and will be categorized as "DE", meaning Detained due to shortage of attendance. The students with the "DE" category cannot proceed to the subsequent semester.
- Such students shall register for all the courses of the semester in which DE has occurred, in the subsequent year by paying the prescribed fee.
- Additional condonation may be considered in rare and genuine cases which includes, approved leave for attending select NCC / Sports Camps, Internships, Training, cases requiring prolonged medical treatment and critical illness involving hospitalization.
- For medical cases, submission of complete medical history and records with prior information from the parent / guardian to the institute is mandatory. Such condonation is permitted only twice for a student in the entire duration of the programme.

Scheme of Examination

The Examination shall be divided into parts i.e. Continuous Internal Evaluation including Assignment, Projects, Seminars, Case Studies and Class Tests which will be of 40 marks and the Semester End Examinations which will be of 60 marks. The semester wise Credit Points will be varied from course to course but the value of Credits for Post-Graduate Programme shall be of 104 Credits. The examinations can be conducted in online/offline mode. The institute may decide the examination pattern - written, oral, practical, presentation, project etc. for any or all courses/subjects as appropriate.

The Credits are defined in terms of the learner's hours which are divided into two parts such as Actual and Notional. The value of a particular course can be measured in number of Credit Points. The value of One (01) Credit is equal to 15 Hours of learners' load. Notional learning hours include direct contact hours with teachers and trainers, time spent in self learning, preparation for assignments, carrying out assignments and assessments etc

Program Credit Distribution chart:

Sr No	Year	Semester	Credits Assigned
1	First	I	26
2		II	25
3	Second	III	26
4		IV	27
Total Semesters – 4			**104**

Course Matrix / Course architecture:

Course code	Definitions	Credits	Courses
CC	Core Courses	63	15
PE	Program Elective	24	3
SEC	Skill Enhancement Courses	17	4
	Total	104	22

Curriculum Matrix:

Bridge Course

- A bridge course for newly admitted students is conducted before the commencement of the first semester classes.
- The main objective of the course is to bridge the gap between subjects studied at Graduation level and subjects they would be studying in this Program.
- The syllabus for the course is framed in such a way that they get basic knowledge on the subjects which they would be learning.

Bridge Course -1

Mathematical Foundation for AI

INTRODUCTION TO LINEAR ALGEBRA

Logic, Propositional Calculus and Counting Techniques, Graph Theory, Languages, Automata, and Turing machine, Vectors and Matrices, Eigen Vectors, quadratic forms and Linear Transformation, Orthogonality, least squares and Euclidean Spaces.

STATISTICS AND PROBABILITY

Probability Distributions, Central Limit Theorem, Random variables, Poisson Distribution, Markov Chains, Descriptive Statistics

Bridge Course -2

INTRODUCTION TO AI & ML

What is AI? Applications and Examples of AI: Students will learn what AI is and will understand its applications and use cases and how it is transforming our lives.

Introducing AI, What is AI?, Impact and Examples of AI, Application Domains for AI
Some Applications of AI

AI Concepts, Terminology, and Application Areas: Student will learn about basic AI concepts and will understand how AI learns, and what some of its applications are.

Cognitive Computing (Perception, Learning, Reasoning), Terminology and Related Concepts, Machine Learning, Machine Learning Techniques and Training, Deep Learning, Neural Networks, Key Fields of Application in AI, Natural Language Processing, Speech, Computer Vision, Self Driving Cars

AI: Issues, Concerns and Ethical Considerations: Students will learn about issues and concerns surrounding AI, including - ethical considerations, bias, jobs, etc. - their impact on society.

Issues and Concerns around AI, AI and Ethical Concerns, AI and Bias, AI: Ethics, Bias, and Trust, Jobs and AI, Employment and AI

The Future with AI, and AI in Action: Students will learn about the current thinking on the future with AI, as well as hear from experts about their advice to learn and start a career in AI.

The evolution and future of AI, Future with AI, The AI Ladder - The Journey for Adopting AI Successfully, Advice for a career in AI, Hotbeds of AI Innovation

FIRST SEMESTER

A. THEORY/PRACTICAL						
S. No.	SUBJECT NAME	SUBJECT TYPE	HOURS / WEEK			CREDITS
			L	T	P	
1	Artificial Neural Networks	CC-1	3	-	2	4
2	Distributed Operating System	CC-2	3	-	2	4
3	Advanced Data Structures	CC-3	4	-	4	6
4	Advanced Database Management Systems	CC-4	3	-	2	4
5	Inferential Statistics	CC-5	3	-	2	4
6	Python Programming	SEC -1	3	-	2	4
			Total of Theory and Tutorial			19
			Total of Practical			7
			Total of Semester			26

SECOND SEMESTER

A. THEORY/PRACTICAL						
S.No.	SUBJECT NAME	SUBJECT TYPE	PERIODS/WEEK			CREDITS
			L	T	P	
1	Advanced Java Programming	CC -6	4	-	4	6
2	Machine Learning	CC -7	3	-	2	4
3	Software Engineering Concepts and Methodologies	CC -8	3	-	0	3
4	Digital Image Processing	CC -9	3	-	2	4
5	Natural Language Processing	CC -10	3	-	2	4
6	Web Technologies	CC -11	3	-	2	4
			Total of Theory and Tutorial			19
			Total of Practical			6
			Total of Semester			25

THIRD SEMESTER

A. THEORY/PRACTICAL

S.No.	SUBJECT NAME	SUBJECT TYPE	PERIODS/WEEK			CREDITS
			L	T	P	
1	Computer Vision	CC-12	3	-	2	4
2	Deep Learning	CC-13	4	-	4	6
3	Program Elective- I	PE-1	3	-	2	4
4	Program Elective - II	PE-2	3	-	2	4
5	Advanced Machine Learning	CC-14	4	-	4	6
6	Placement training	SEC-2	2	-	0	2
			Total of Theory & Tutorial			**19**
			Total of Practical			**7**
			Total of Semester			**26**

Program Elective I
Chat-bot Development
Big Data Analytics

Program Elective II
Sensor Technology
Intelligent Process Automation

FOURTH SEMESTER

A. THEORY/PRACTICAL						
S.No.	CODE	SUBJECT NAME	SUBJECT TYPE	PERIODS/WEEK			CREDITS
				L	T	P	
1		Final Project/ Internship and Viva	PE-3	-	-	32	16
2		Research Methodology	SEC- 3	5	-	-	5
3		Research Project	SEC-4	-	-	12	6
			Total of Theory & Tutorial				**5**
			Total of Practical				**22**
			Total of Semester				**27**

Distribution of Credits Semester-wise: