

EXTRACT FROM THE MINUTES OF THE ORDINARY ACADEMIC COUNCIL HELD ON

Appendix- XXVI

प्राप्त संख्या/R.No. 3332

नांक/Date 25/1/21

प्रवेश अनुभाग/Admissions Section  
अलीगढ़ मुस्लिम विश्वविद्यालय  
Aligarh Muslim University

Item No. 7 : TO CONSIDER THE MINUTES OF THE ORDINARY MEETING OF THE FACULTY OF SCIENCE HELD ON 19.12.2020

The house considered the minutes of the Ordinary meeting of the Faculty of Science made at its meeting held on 19.12.2020:-

पत्रांक/R.No. 497

दिनांक/Date 27/1/21

Item No. 2 (BOS Dated 21.10.2020 Item No.2)  
(Department of Computer Science)

The proposal of the Department of Computer Science for starting new program "M.Sc. in Data Science & Artificial Intelligence" deferred due to the existing staff cannot undertake the work load of the course.

Item No. 2 (BOS Dated 21.10.2020 Item No.3)  
(Department of Computer Science)

Approved the proposal for starting new course as "M.Sc. in Cyber Security & Digital Forensics" in the Department of Computer Science from the session 2021-22 with the condition that Department will run the course with the existing teaching staff and recommended to the Admission Committee with the following intake:

25 General }  
05 NRIs } Total -30

Item No. 2 (BOS Dated 04.01.2021 Item No.2)  
(Department of Statistics and Operations Research)

Approved the proposal for starting new course as "M.Sc. (Data Science)" in the Department of Statistics & O.R. from the session 2021-22 with the condition that Department will run the course with the existing teaching staff and recommended to the Admission Committee with the following intake:

20 General }  
05 NRIs } Total -25

Office of the Registrar  
(Councils Section)  
Aligarh Muslim University  
Aligarh.

No.C.I-AC(810)/3526

Jan. 23 , 2021

Copy to the following for information and necessary action:

1. Dean, Faculty of Engineering and Technology
2. Chairman, D/o Computer Science/ Statistics & OR
3. Controller of Examinations Along with relevant papers to place the matter in Admission Committee
4. Assistant Registrar, VC's Secretariat
5. Sr. P.A. to Registrar
6. Guard File

J.C. (Adm)

Mr. Arifuddin Ahmed  
(Md. Arifuddin Ahmed)

Joint Registrar  
(Councils)

Section Officer  
(Admissions)  
25/1/21



OFFICE OF THE DEAN  
FACULTY OF SCIENCE  
A.M.U., ALIGARH

Dated: 30.12.2020

APPENDIX-IV  
ITEM No.- 7


No. 811 /F.Sc.

Extract from the ordinary meeting of the Faculty of Science held on 19.12.2020 under the items as per details below

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Item No. 2 Considered, approved and recommended to the Academic Council the Introduction of new Degree/Diploma/etc programme in Faculty of Science.

Date of B.O.S.	Item No.	Item	Decision
<b>Computer Science</b>			
1.10.2020	2	Approval of new program, M.Sc. in Data Science & Artificial Intelligence to be started in the Department of Computer science from session 2021-22.  Discussion & Decision: The members of the BoS discussed the proposal of M.Sc. in Data Science & Artificial Intelligence and approved the same. (Annexure-B: Proposal of M.Sc. in Data Science & Artificial Intelligence).	Approved
1.10.2020	3	Approval of new program M.Sc. in Cyber Security & Digital Forensics to be started in the Department of Computer science from session 2021-22.  Discussion & Decision: The members of the BoS discussed the proposal of M.Sc. in Cyber Security & Digital Forensics and approved the same (Annexure-C: M.Sc. in Cyber Security & Digital Forensics).	Approved
<b>Statistics &amp; O.R.</b>			
1.11.2020	2	Considered and approved the introduction of M.Sc (Data Science).  Introduction of a new P.G. Programme by the Department of Statistics & O.R. is also approved but to avoid duplicacy it is decided that the programme is renamed as <b>M.Sc. (Data Analytics)</b> . The Dean is authorized to forward the M.Sc. (Data Analytics) course structure to the Academic Council after ratification and changes by the B.C.S. of Department of Statistics & O.R.	Approved

  
30/12/2020  
(Prof. Qazi Nisar Ali)  
Dean  
Faculty of Science  
A M. U., Aligarh

Copy to : Assistant Registrar (Council) for necessary action.

No. (C) 2906

Dated 30/12/20

Councils. Section) at 4:10 pm

Mr. Kashif

  
Joint Registrar

Joint Registrar  
(Councils/परिषद्)  
30/12

(130)

R.No. 4172 /FSL  
Dated 23.10.2020

DEPARTMENT OF COMPUTER SCIENCE  
ALIGARH MUSLIM UNIVERSITY,  
ALIGARH

D.No. 1504 /Comp. Sc.  
Dated 22-10-2020

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Minutes

Dated: 22.10.2020

Minutes of the online Special Meeting of Board of Studies held on  
21.10.2020 at 11:30 a.m.

The following members were present:

- |  |   |
|--|---|
| 1. Prof. Mohammad Ubaidullah Bokhari       | Professor   |
| 2. Prof. Jamshed Siddiqui                  | Professor   |
| 3. Mr. S. Maheshwari                       | Associate Professor                                   |
| 4. Ms. Priti Bala                          | Associate Professor                                   |
| 5. Mr. Suhel Mustajab                      | Associate Professor                                   |
| 6. Dr. Aasim Zafar                         | Associate Professor                                   |
| 7. Mr. Shahid Masood                       | Associate Professor                                   |
| 8. Dr. Tamanna Siddiqui                    | Associate Professor                                   |
| 9. Ms. Sehba Masood                        | Assistant Professor                                   |
| 10. Dr. Arman Rasool Faridi                | Assistant Professor                                   |
| 11. Dr. Swaleha Zubair                     | Assistant Professor                                   |
| 12. Dr. Faisal Anwer                       | Assistant Professor                                   |
| 13. Dr. Mohammad Sajid                     | Assistant Professor                                   |
| 14. Dr. Mohammad Nadeem                    | Assistant Professor                                   |
| 15. Prof. Rafiqul Zaman Khan<br>(In Chair) | Chairperson, D/o Computer Science<br>A.M.U., Aligarh. |

S.O. / Mr. Ghayas  
1. One copy to AR (Ac.)  
2. To put up next Faculty meet.  
3. Approval of A.S.  
DE-AM  
Faculty of Science  
A.M.U., Aligarh  
Shakeel  
23/10/2020

Prof. Rafiqul Zaman Khan, Chairperson chaired the meeting and welcomed all the members to the BoS meeting. The following items were discussed during the meeting:

ITEM #1: To discuss and consider the revised qualification and duration of MCA as per the AICTE letter Ref. No. F.No. AICTE/AB/MCA/2020-21 dated: 03.07.2020. (To be implemented from the academic session 2020-21).

➤ Discussion & Decision: The Members of the BoS discussed in detail revised qualification and duration of MCA as per the AICTE letter mentioned above and following decisions have been taken:

1. Change the name of the program from Master of Computer Science & Applications (MCA) to Master of Computer Applications (MCA) in conformity with the UGC/AICTE nomenclature and recommended its implementation with effect from session 2020-21.
2. Change the duration of MCA from three years program to two years as advised by the AICTE/UGC vide letter no. F.No. AICTE/AB/MCA/2020-21 dated: 03.07.2020 and recommended its implementation with effect from session 2020-21.
3. The qualification of two years MCA is amended as given

Existing:

Name of the program/Subject	Allotted Seats	Faculty/ Department/ Centre	Duration (Semesters/Academic Years)	Minimum Eligibility Requirements for Admission
Master of Computer Science & Applications (MCA)	60	Department of Computer Science	6 Semesters (spread over 3 years)	B.Tech./B.Arch./B.E. with 55% marks in aggregate. OR 1 Bachelor Degree in Science from a recognized university with 55% marks in aggregate and must have studied Mathematics alongwith any two of the following subjects: Statistics, Physics, Chemistry, Computer Application, Computer Maintenance, Information Technology as main or subsidiary subject at the qualifying examination. 2 Must have studied Physics and Mathematics in the Senior Secondary School Certificate or its equivalent course.

Amended:

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Name of the Program/Subject	Allotted Seats	Faculty/Department/Centre	Duration (Semesters/Academic Years)	Minimum Eligibility Requirements for Admission
Master of Computer Applications (M.C.A.)	60	Department of Computer Science	4 Semesters (spread over 2 years)	<ol style="list-style-type: none"><li>1. Passed Bachelor Degree in Computer Science / Engineering / Architecture/ Computer Applications/ Information Technology/ Computer Maintenance. OR</li><li>1'. Passed B.Sc./B.Com/B.A. or equivalent (a candidate must either produce 'a valid certificate of passing at least two courses of Computer Science with at least 50% marks or equivalent from any Govt-approved mode at 10+2/graduation level' OR 'complete the bridge courses from the Department in the first semester of MCA')</li><li>2. Must have studied mathematics at 10+2 Level or its equivalent course.</li><li>3. Obtained at least 50% marks in the qualifying examination.</li></ol>

(Annexure-A: Two years MCA structure)

**ITEM #2:** Approval of new program, M.Sc. in Data Science & Artificial Intelligence to be started in the Department of Computer science from session 2021-22.

- **Discussion & Decision:** The members of the BoS discussed the proposal of M.Sc. in Data Science & Artificial Intelligence and approved the same. (Annexure-B: Proposal of M.Sc. in Data Science & Artificial Intelligence).

**ITEM #3:** Approval of new program M.Sc. in Cyber Security & Digital Forensics to be started in the Department of Computer science from session 2021-22.

- **Discussion & Decision:** The members of the BoS discussed the proposal of M.Sc. in Cyber Security & Digital Forensics and approved the same (Annexure-C: M.Sc. in Cyber Security & Digital Forensics).

Keeping in view the importance of the new programs M.Sc. in Data Science & Artificial Intelligence and M.Sc. in Cyber Security & Digital Forensics, (discussed in Item#2 & Item#3) the BoS unanimously decided that the programs should be started from the academic session 2021-2022 and the same are recommended to the Faculty and Academic Council for necessary approval. The UGC should be approached to sanction the posts to start and run the programs, and the proposal for the same be sent to the UGC. Till the sanction is awaited from the UGC, the Hon'ble Vice-Chancellor be requested to kindly allow to utilize at least three (03) vacant Assistant Professor post(s) of any other departments to run these two M.Sc. programs. As and when the sanction is received from the UGC, the said post(s) will be reverted back to the respective departments. The BoS further decided that these two new programs should be started after getting above said teaching post(s).

**ITEM #4: Appointment of Co-supervisor of Mr. Ankur Kumar, a Ph.D. scholar working under the supervision of Dr. Mohammad Nadeem.**

- > **Discussion & Decision:** The members discussed the Co-supervisor (details given below) to be appointed of Mr. Ankur Kumar, a Ph.D. scholar working under the supervision of Dr. Mohammad Nadeem and approved the same.

**Details of approved Co-supervisor of Mr. Ankur Kumar**

Dr. Mohammad Shameem, [Ph.D. IIT (ISM, Dhanbad)]  
 Assistant Professor  
 Department of Computer Applications  
 Madanapalle Institute of Technology and Science  
 Madanapalle, Andhra Pradesh, India  
 Research Publications: 22 (11 in SCIE indexed journals)

The Members appreciated the work of New Academic Programs Planning and Implementation Committee to design two years MCA structure and proposals of two new M.Sc. programs: M.Sc. in Data Science & Artificial Intelligence and M.Sc. in Cyber Security & Digital Forensics.

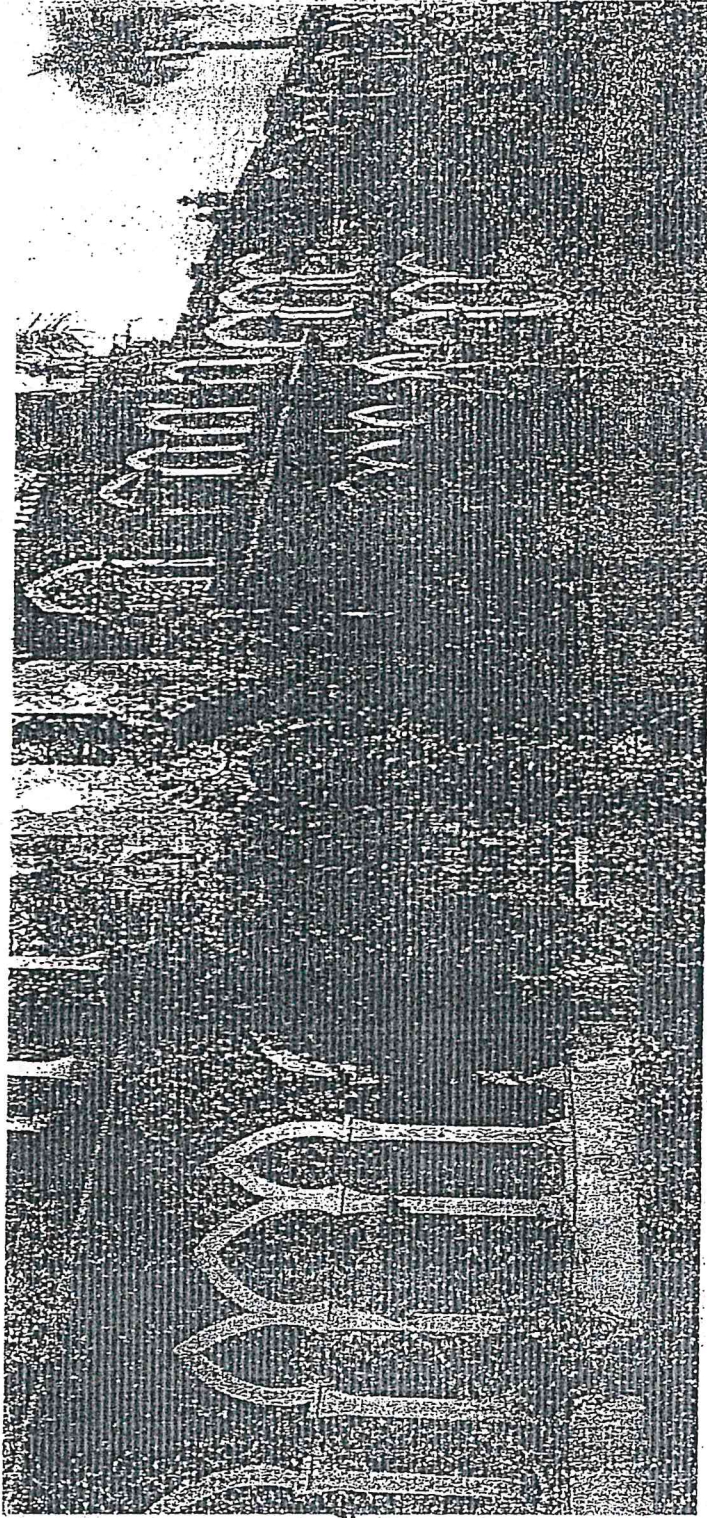
After discussion and approval of all the items of the agenda, the meeting came to end with vote of thanks to the chair.

*Rafiqul Zaman Khan*  
 22.10.2020

(Prof. Rafiqul Zaman Khan)  
 CHAIRPERSON  
 Chairperson  
 Dept. of Computer Science  
 A.M.U., Aligarh

*Rafiqul Zaman Khan*

**Master of Computer Applications  
(M. C. A.)**



**Department of Computer Science  
Faculty of Science  
Aligarh Muslim University**



# M.C.A. (2 Years Program)

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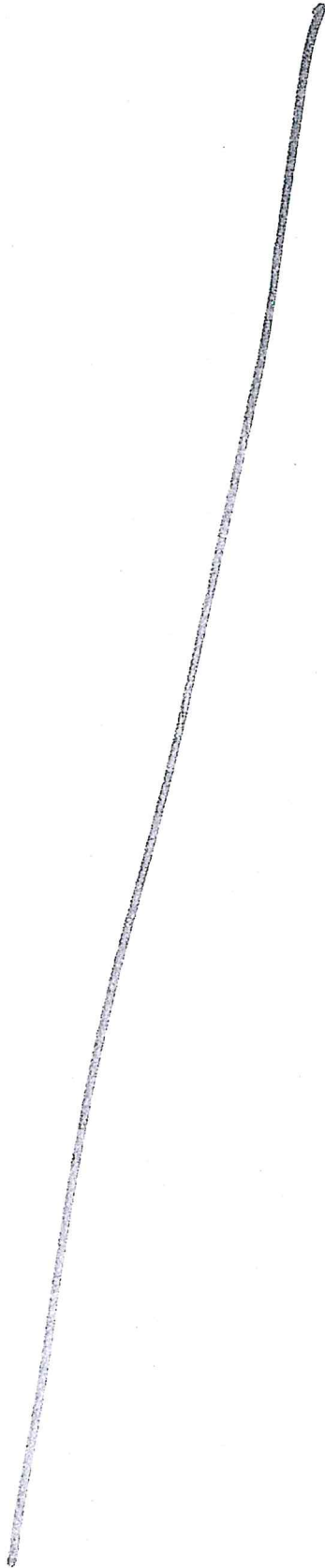
I.	Reference	1. Notification No. AICTE/AB/MCA/2020-21/03-07020 2. Adaptation by HOS dated 21.10.2020 for MCA (2-Years) program.
II.	Bases	UGC Guideline on Choice Based Credit Based System (CBCS) – with greater autonomy to students on the selection of courses -- by reinforcing the following: 1. Retaining prescribed types as Core, Electives, CBCS, Ability/Skill enhancement courses. 2. Retaining the 4 <sup>th</sup> semester as full project-semester, because of the mandate of MCA as a professional program and placements.
III.	Periods Per Week (L+T)/P	1. Core Theory Courses: 3+1 and 1+1 2. Lab-Courses: 6 3. CBCS Elective Courses: 3+1 4. Ability Enhancement Course (Open Elective): 3+1
IV.	Eligibility Criteria	1. Passed Bachelor Degree in Computer Science / Engineering / Architecture/ Computer Applications/ Information Technology/ Computer Maintenance.  OR 1. Passed B.Sc./B.Com/B.A. or equivalent (a candidate must either produce a valid certificate of passing at least two courses of Computer Science with at least 50% marks or equivalent from any Govt-approved mode at 10+2/graduation level' OR 'complete the bridge courses from the Department in the first semester of MCA') 2. Must have studied mathematics at 10+2 Level or its equivalent course. 3. Obtained at least 50% marks in the qualifying examination. Applicable to those who passed B.Sc./B.Com./B.A. or equivalent and not able to produce a valid certificate of passing at least two courses of Computer Science with at least 50% marks or equivalent from any Govt-approved mode at 10+2/graduation level.
V.	Bridge Courses	1. CBCS course of 4 credits need to be chosen from other departments of the faculty of science. 2. At least four courses shall be offered for each of the electives, provided a minimum of 15 students opt for the course and availability of teachers. 3. Department may float any other elective, beyond the listed ones, subject to feasibility and endorsement of BOS.
VI.	Notes	

DEPARTMENT OF COMPUTER SCIENCE  
ALIGARH MUSLIM UNIVERSITY  
ALIGARH, U.P. - 202002  
Master of Computer Applications (MCA) (CBCS)  
Curriculum Structure

COURSE NO.	PAPER TITLE	Type of Course	Periods Per Week (L+T)/P	Credits	Sessional Marks/Continuous Evaluation	Final Marks	Total Marks
<b>MCA 1<sup>st</sup> Year-I-Semester</b>							
I <sup>st</sup> SEMESTER	CSD1001	Problem Solving using C	3+1	4	30	70	100
	CSD1002	Fundamentals of Algorithms	1+1	2	30	70	100
	CSD1003	Digital Logic and Computer Architecture	3+1	4	30	70	100
	CSD1004	Database Management System	3+1	4	30	70	100
	CSD1005	Systems Analysis and Design	3+1	4	30	70	100
	CSD1006	Soft Skills Development and Technical Communication	3+1	4	30	70	100
	CSD10P1	Laboratory Course -I		6	40	60	100
<b>Total</b>				<b>26</b>		<b>60</b>	<b>700</b>
<b>MCA 1<sup>st</sup> Year-II-Semester</b>							
II <sup>nd</sup> SEMESTER	CSD2001	Object Oriented Programming using Java	3+1	4	30	70	100
	CSD2002	Object Oriented Analysis and Design	3+1	4	30	70	100
	CSD2003	Data Structure and its Applications	1+1	2	30	70	100
	CSD2004	Discrete Mathematics	1+1	2	30	70	100
	CSD2005	Data Communication & Computer Networks	3+1	4	30	70	100
	EL-1	Elective-1		4	30	70	100
	EL-2	Elective-2		4	30	70	100
	OE	Open Elective**		4	30	70	100
	CSD20P1	Laboratory Course -II		6	30	70	100
	<b>Total</b>				<b>4</b>	<b>40</b>	<b>60</b>
<b>MCA 2<sup>nd</sup> Year-III-Semester</b>							
III <sup>rd</sup> SEMESTER	CSD3001	Operating System	1+1	2	30	70	100
	CSD3002	Software Engineering	1+1	2	30	70	100
	CSD3003	Theory of Computation and Compiler construction	3+1	4	30	70	100
	CSD3004	Microprocessor: Architecture and Applications	1+1	2	30	70	100
	CSD3005	Web based Programming	3+1	4	30	70	100
	CSD3306	Artificial Intelligence & Soft Computing	3+1	4	30	70	100
	EL-3	Elective-3		4	30	70	100
	EL-4	Elective-4		4	30	70	100
	CSD30P1	Laboratory Course-III		6	30	70	100
	<b>Total</b>				<b>4</b>	<b>40</b>	<b>60</b>
<b>Total</b>				<b>30</b>		<b>60</b>	<b>900</b>

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COURSE NO.	PAPER TITLE	Type of Course	Periods/Per Week (L:T/P)	Credits	Session Marks/Continuous Evaluation	Final Marks	Total
<b>MCA 2<sup>nd</sup> Year-IV-Semester</b>							
IV <sup>th</sup> SEMESTER	CSD4491	Fundamentals of IT (Open Elective) <sup>#</sup>	3+1	3	30	70	100
	CSD4001	Major Project		8	40	60	100
		<b>Total</b>		<b>8</b>			<b>100</b>

\*L - Lecture; \*T - Tutorial; \*P - Practical/Lab; \*D - Dissertation/Project;

#Non-credit and qualifying course

**Course Categories and Credits allotted**

S.No	Type of Courses	Code	Credits Allotted
1	Core	C	64
2	Elective (Discipline Centric)	E	16
3	Ability Enhancement (Discipline Centric)	A	12
4	Ability Enhancement (Open elective)	OE	4
5	Bridge Course	B	Non-Credit
Total Credits:			96

Students are required to select one course from each set of electives (EL-1 to EL-4) offered by the department from time-to-time.

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Electives	Course No.	Paper Title	Course No.	Paper Title	Course No.	Paper Title	Course No.	Paper Title
EL-1 (Credit-4)	CSD2051	Data Mining Techniques and Applications	CSD2052	Mobile Computing	CSD2053	Computer Graphics	CSD2054	Fuzzy Systems and Control
EL-2 (Credit-4)	CSD2061	Parallel and Cloud Computing	CSD2063	Cyber Security	CSD2063	Advanced DBMS and Data Warehouse Design	CSD2064	Simulation and Modeling
EL-3 (Credit-4)	CSD3051	Linux and Shell Programming	CSD3052	Network Programming	CSD3053	Mobile Programming	CSD3054	Introduction to Computational Finance
EL-4 (Credit-4)	CSD3061	E-Commerce	CSD3062	Big Data Analytics	CSD3063	Optimization Techniques	CSD3064	Introduction to Quantum Computing

\*\*Students of the department of Computer Science are required to opt any Open Elective course offered by other departments of faculty of Science, in Second Semester preferably Mathematics, Statistics & OR, GIS, etc.

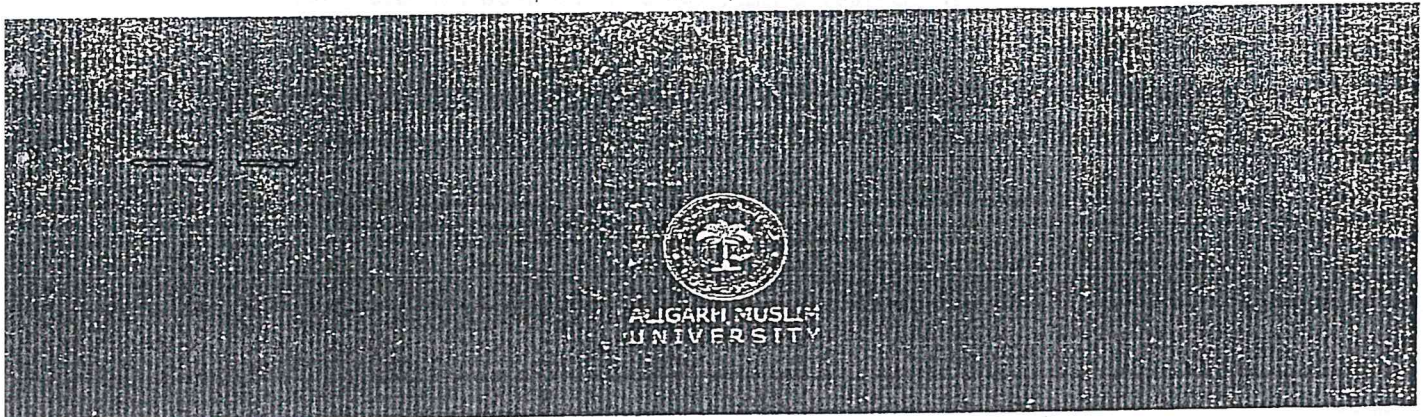
# CSD4491 (Open Elective): Fundamentals of IT (For fourth semester students of Faculty of Science other than Computer Science).

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**Proposal  
of  
M.Sc. in Cyber Security & Digital Forensics**  
(Adaptation by BOS dated 21.10.2020)



**Department of Computer Science  
Faculty of Science  
Aligarh Muslim University**



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# Introduction

Information and communication technology have truly introduced the concept of global village, where every individual can access and share information from any part of the world. At one side, it provides enormous benefits but at the same time poses many serious threats including data theft, online transaction fraud, cheating scam and others. Therefore, there is an urgent need in India and abroad to train and produce experts, who are equipped with essential knowledge of cyber security and know how to apply their knowledge to protect cyber space and digital forensics. Cyber security provides the required functionality to protect the cyber critical infrastructure from attack, damage, misuse and economic espionage.

**“there is an urgent need in India and abroad to train and produce experts, who are equipped with essential knowledge of cyber security and know how to apply their knowledge to protect cyber space and digital forensics”**

## Program at a glance

- 1) Course Name : M. Sc. in Cyber Security & Digital Forensics
- 2) Nature : Regular, Full Time (Semester System)
- 3) Duration : 2 Years (4 Semesters)
- 4) Eligibility Criteria : B. Tech. / B. Arch. / B.E. with 55% marks in aggregate OR  
 1. BCA/BIT/B.Sc. from a recognized University with 55% marks in aggregate and must have studied Mathematics at the qualifying examination.  
 2. Must have studied Physics and Mathematics in the Senior Secondary School Certificate or its equivalent Course:
- 5) Mode of Admission : National level written test conducted by AMU.
- 6) Theoretical Papers : 60 Credits



- 7) Lab Papers : 24 Credits
- 8) Research Project : 12 Credits
- 9) Degree Requirement : Besides fulfilling required credits, a minimum of one published/accepted research paper in conference or Journal of International Repute based on his assigned M.Sc. research project work
- 10) Intake : 25+ 5\*  
\*Seat reserved for NRI/Foreign Nationals. These seats may be filled by Indian students provided seat remain vacant.

## Importance of the Program

### Observations

- The *Hon'ble Prime Minister of India* in his speech on India's 74<sup>th</sup> Independence Day stressed the need of cyber security policy. *ThePrint* quoted "Modi said that his government is aware of the threats emanating from cyber space and how they had the potential to impact India's society, economy and development."
- *Business Insider* quoted "India has seen a 37% increase in cyberattacks in the first quarter (Q1) of 2020, as compared to the fourth quarter (Q4) of last year."
- Due to Covid-19 crises, the online activities such as online transaction, online teaching and others increased manifold and hence Cyber threats also surged in the current scenario. According to latest study mentioned by *Purplesec.us* "Cybercrime Up 600% due to Covid-19 pandemic". The current Covid-19 situation has made the people habitual of online activities that will be carried on even after pandemic is over.
- India has been the favorite spot of cyber attackers for the last few years. In fact, India has seen the most number cyber-attacks in the world in the second quarter of 2019 and remained within top 5 throughout the year, reported by *ThePrint*.

### References:

The observations of cyber incidents/threats/challenges, some of them mentioned above, lead to conclude that there is an urgent need to design a program related to Cyber security & Digital Forensics for training the students so that they shall be able to minimize the impact of cyber threats on India's society, economy and development.

## Objectives

- To produce experts in the field of cyber security.
- To prepare students for higher research studies in the field of Cyber security
- To train human resource in the field of cybercrime investigation, which can aid our law enforcement agencies.
- To train students to build secure systems.
- To produce experts, who can analyze the cyber space for security threats.
- To instill in them essential knowledge of cyber security for new innovations.
- To produce research scientists in the field of Cyber security & Digital forensics

## Outcomes

After completing M.Sc. Cyber Security & Digital Forensics, the students will be able to:

- Apply the knowledge of cyber security fundamentals to solve complex security threats.
- Design the solution of potentials cyber threats that meet the specific needs and design components or processes with appropriate consideration for the public safety and security.
- Create, select, and apply appropriate techniques, resources, and modern tools to handle complex real-life security issues with an understanding of the limitations.
- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- Use research-based knowledge of cyber security & digital forensic, and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions that will be useful for getting admission in Ph.D. in India and abroad.
- Identify, formulate, review research literature in the field of cyber security and digital forensic, and analyze complex problems reaching substantiated conclusions using principles of mathematics and computer science.

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- Apply ethical principles and commit to professional ethics, responsibilities and norms of standard practices.
- Recognize the need for and have the ability to engage in independent and lifelong learning in the broadest context of technological change.

## **Employment Areas of Cyber Security & Digital Forensics**

- Research and innovation Labs
- Cyber Forensics Labs
- Intelligence Agencies
- Educational institutes
- IT Industries
- Banking and insurance
- Others

## **Job categories in the field of Cyber Security & Digital Forensics**

- Manager - Quality Assurance & Cyber Security
- Cyber Security Officer
- Cyber Security Trainer
- Cyber Security Analyst
- Information Protection Specialist
- Penetration Tester
- Ethical Hacker
- Cyber Crime Analyst
- Security Architect

- Cyber Security Engineer
- Cyber Security Research Scientist

**Cyber security & Digital forensic labs/Centre:**

- The Indian Computer Emergency Response Team (Cert-In) within the Ministry of Electronics and Information Technology of the Government of India that deals with cyber security threats like hacking and phishing.
- National Cyber Forensic Lab, part of the Union Home Ministry's Indian Cyber Crime coordination Centre (I4C).
- Resource Centre for Cyber Forensics (RCCF) is a pioneering institute under CDAC to perform research activities in the area of Cyber Forensics.

**Universities/Institutes running similar courses**

- **Gujrat Forensic Sciences University:**
  - M.Sc. Digital Forensic and Information Security
  - M. Sc. Cyber Security
- **University of Madras:**
  - M.Sc. Information Security and Cyber Forensics
- **Sardar Patel University of Police, Security and Criminal Justice**
  - M.Sc. Applied Criminology
- **Calicut University:**
  - M.Sc. Cyber Security
- **Chandigarh University:**
  - M.Sc. Cyber Security
- **Center of Excellence in Digital Forensics, Chennai:**
  - M.Sc. Information Security and Cyber Forensics
- **Amity University, Jaipur:**
  - M.Sc. Cyber Security
- **Centurion University:**
  - M.Sc. Cyber Security

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# Manpower Requirements

The following manpower is required to effectively run this program

Sr. No.	Post		Requirement
1	Teaching	Professor	01
2		Associate Professor	01
3		Assistant Professor	03
4	Non-teaching	MTS	01
5		Technical Assistant (Computer)	01

# Infrastructure Requirements

We will utilize existing infrastructure of the Department.

# Curriculum of M.Sc. in Cyber Security & Digital Forensics

COURSE NO.	PAPER TITLE	Type of Course	Periods Per Week (L+T)/P	Credits	Sessional Marks/ Continuous Evaluation	Final Marks	Total Marks
<b>First Semester</b>							
CSC1001	Mathematics for Cyber Security	C	3+1	4	30	70	100
CSC1002	Introduction to Cyber Security	C	3+1	4	30	70	100
CSC1003	Problem Solving using C++	C	3+1	4	30	70	100
CSC1004	Numerical and Statistical Computing	C	3+1	4	30	70	100
CSC1005	Cloud and Distributed Computing	C	3+1	4	30	70	100
CSC10P1	Laboratory Course -I	C	6	4	40	60	100
CSC10P2	Laboratory Course -II	C	6	4	40	60	100
	<b>Total</b>			<b>28</b>			<b>700</b>
<b>Second Semester</b>							
CSC2001	Cryptography and Network Security	C	3+1	4	30	70	100
CSC2002	Malware Analysis and Penetration Testing	C	3+1	4	30	70	100
EL-1	Elective-I	C	3+1	4	30	70	100
EL-2	Elective-II	C	3+1	4	30	70	100
OE	Open Elective**	OE	3+1	4	30	70	100
CSC20P1	Laboratory Course -I	C	3+1	4	40	60	100
CSC20P2	Laboratory Course -II	C	6	4	40	60	100
	<b>Total</b>			<b>28</b>			<b>700</b>
<b>Third Semester</b>							
CSC3001	Cloud Security	C	3+1	4	30	70	100
CSC3002	Digital Forensics	C	3+1	4	30	70	100

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CSC3004	Cyber Crimes and Laws	C	3+1	4	30	70	100
EL-3	Elective-III	C	3+1	4	30	70	100
EL-4	Elective-IV	C	3+1	4	30	70	100
CSC30P1	Laboratory Course-I	C	3+1	4	40	60	100
CSC30P2	Laboratory Course-II	C	6	4	40	60	100
	Total			28			700
<b>Fourth Semester</b>							
CSC4001	Research Project	A		12	40	60	100
	Total			12			100

\*L - Lecture; \*T - Tutorial; \*P - Practical/Lab; \*D - Dissertation/Project;

### Course Categories and Credits allotted

- The courses mentioned in above curriculum are of following categories.

S.No.	Course Categories	Code	Credits Allotted
1	Core	C	64
2	Elective (Discipline Centric)	E	16
3	Ability Enhancement (Discipline Centric)	A	12
4	Ability Enhancement (Open elective)	OE	4
Total Credits			96

### List of Electives

- Students are required to select one course from each set of electives (EL-1 to EL-4) offered by the department from time-to-time.

Electives	Course No.	Paper Title	Course No.	Paper Title
EL-1 (Credit-2)	CSC2051	Web Applications Security	CSC2052	Data Mining and Defects Prediction
EL-2 (Credit-4)	CSC2061	Mobile Security	CSC2063	Cyber Security and Privacy in IoT
EL-3 (Credit-4)	CSC3051	Language Based Security	CSC3052	Software Security Testing
EL-4 (Credit-4)	CSC3061	Quantum Computing and Cryptography	CSC3062	Computational Intelligence for Cyber Security

\*\*Students of the department of Computer Science are required to opt any Open Elective course offered by other departments of faculty of Science, in Second Semester preferably Mathematics, Statistics & OR, GIS, etc.

\*\*\*CSD4491(Open Elective): Fundamentals of IT (For fourth semester students of Faculty of Science other than Computer Science.

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**Proposal  
of  
M.Sc. in Data Science & Artificial Intelligence**

(Adaptation by BOS dated 21.10.2020)



**Department of Computer Science  
Faculty of Science  
Aligarh Muslim University**



**ALIGARH MUSLIM  
UNIVERSITY**

## Introduction

With the advent of Internet and specially internet-of-things (IoT), digital devices are connected with each other like never before. Their intercommunication is generating huge amount of data which carry useful information within it. Data is the new Oil and Data Science & Artificial Intelligence (AI) provides necessary techniques to extract and process this type of oil. Data generated from domains such as Stock Markets, Social Media, Medical Sciences & Diagnostics and many others can be processed for human welfare. The study of Data Science and Artificial Intelligence provide us necessary tools to draw useful inferences from data gathered from various sources. This program is designed to produce experts in the field of Data Science and Artificial Intelligence who have necessary knowledge and skills and can use the same to solve real-life problems of various domains based on huge datasets.

**“Data is the new Oil and Data Science & Artificial Intelligence (AI) provides necessary techniques to extract and process this type of oil”**

## Program at a glance

- 1) Course Name : M. Sc. in Data Science & Artificial Intelligence
- 2) Nature : Regular, Full Time (Semester System)
- 3) Duration : 2 Years (4 Semesters)
- 4) Eligibility Criteria : B. Tech. / B. Arch. / B.E. with 55% marks in aggregate OR
  - 1. BCA/BIT/B.Sc. from a recognized University with 55% marks in aggregate and must have studied Mathematics at the qualifying examination.
  - 2. Must have studied Physics and Mathematics in the Senior Secondary School Certificate or its equivalent Course.
- 5) Mode of Admission : National level written test conducted by AMU.
- 6) Theoretical Papers : 60 Credits



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- 7) Lab Papers : 24 Credits
- 8) Research Project : 12 Credits
- 9) Degree Requirement : Besides fulfilling required credits, a minimum of one published/accepted research paper in conference or Journal of International Repute based on his assigned M.Sc. research project work.
- 10) Intake : 25+5\*  
\*Seat reserved for NRI/Foreign Nationals. These seats may be filled by Indian students provided seat remain vacant.

## Importance of the Program

### Observations

- The current ruling party, in the manifesto of 2019 has promised to make India 3<sup>rd</sup> largest economy in the world by 2030, with a GDP of \$10 trillion by the year 2032. They have promised to promote artificial intelligence, data analytics and blockchain, among others to achieve the milestone, quoted by *Analytics India Magazine*.
- According to a recent article of *Gartner* that Data and analytics combined with AI technologies will be of paramount importance to predict, prepare and respond in a proactive and accelerated manner to the worldwide crisis and its aftermath such as Covid-19 pandemic.
- Data science is ranked topmost profession according to *Glassdoor*, a job search website.
- *Gartner* reported that AI techniques will serve as the foundation of 80% of the emerging technologies by 2021.
- According to the article of *statista*, the global AI market has grown by 54% in 2019 and other reports suggest that this market will grow further in upcoming years.

### References:

- The observations of reports/articles/news/etc. about Data science and AI, some of them mentioned above, lead to conclude that there is an urgent need

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to design a program related to Data science and AI for training the students so that they shall have necessary knowledge and skills to solve real-life problems of various domains based on huge datasets.

## Objectives

- To produce experts in the field of Data Science & AI.
- To prepare students for higher research studies in the field of Data Science & AI, India and abroad
- To make students capable of drawing substantial inferences using data science & AI techniques in real life scenario.
- To train students to develop intelligent tools and software in various application domains.
- To produce experts, who can analyze the raw data to make concrete future predictions.
- To equip students with essential knowledge of data science & AI for new innovations.

## Outcomes

After completing M.Sc. Data Science & AI, the students will be able to

- Apply the knowledge of Data science & AI fundamentals to solve complex real-life problems.
- Use the appropriate techniques, tools and skills necessary for Data Science and AI.
- Design the intelligent systems for various needs of businesses and industries.
- Create, select, and apply appropriate techniques, resources, and modern tools to handle complex real-life issues with an understanding of the constraints.
- Contribute immensely in the data rich domains such as Bioinformatics, Remote sensing, Chemo-informatics, Medical data processing and others.

- Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- Use research-based knowledge of Data science & AI, and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- Identify, formulate, review research literature in the field of Data science & AI; and analyze complex problems reaching substantiated conclusions using principles of mathematics, statistics and computer science.
- Apply ethical principles and commit to professional ethics, responsibilities and norms of standard practices.
- Recognize the need for and have the ability to engage in independent and lifelong learning in the broadest context of technological changes.

## **Prominent Applications of Data Science & Artificial Intelligence**

- Health Care Industries
  - Chemical Concentration Prediction
  - Drug discovery
  - Early Disease Prediction
  - others
- Business and Marketing
  - Customer Segmentations
  - Product and Goods recommendation system
  - Prediction of potential customers
  - others
- Smart Cities
  - Traffic congestion prediction and alternative path recommendation

- Power consumption prediction
- Education
  - Course Recommendation systems
  - Book Recommendation systems
  - Others
- Banking and stock market
  - Stock trend prediction
  - Banking fraud prediction
  - others

## **Employment areas of Data Science & Artificial Intelligence**

- Research and innovation Labs
- Intelligence Agencies
- Medical Research Labs
- Meteorological Sciences
- Educational institutes
- Stock Markets
- Banking and Insurance
- IT Industries
- Others

## **Job categories in the field of Data Science and Artificial Intelligence**

- Data Scientist
- Business Intelligence Developer
- Machine Learning Engineer
- Statistician
- Big Data Engineer
- Big Data Architect
- Data Analyst
- Data Researcher
- Expert Analyst
- Data Programmer
- Machine Learning Scientist
- Application Architect
- Enterprise Architect
- Data Architect

## **Universities/Institutes running similar courses**

- Chennai Mathematical Institute:
  - M.Sc. Data Science
- Central University of Rajasthan:
  - M.Sc. Big Data Analytics
- Christ University:
  - ~~M.Sc. Data Science~~
- Chandigarh University:
  - M.Sc. Data Sciences
- Sardar Patel University, Gujrat:
  - M.Sc. Artificial Intelligence and Machine Learning
- Bharathiar University:

- M.Sc. Data Analytics
- Vellore Institute of Technology:
  - M.Sc. Data Science
- Manipal University:
  - M.Sc. in Data Science
- Symbiosis Institute of Geo-informatics:
  - M.Sc. Data Science and Spatial Analytics
- Reva University:
  - M.Sc. in Data Science and Machine Learning
- XLRI Jamshedpur
  - Postgraduate Certification in Business Analytics (PGCBA)

### Manpower Requirements

- The following manpower is required to effectively run this program:

Sr. No.	Post		Requirement
1	Teaching	Professor	01
2		Associate Professor	01
3		Assistant Professor	03
4	Non-teaching	MTS	01
5		Technical Assistant (Computer)	01

### Infrastructure Requirements

- We will utilize existing infrastructure of the Department.

### Curriculum of M.Sc. in Data Science & Artificial Intelligence

COURSE NO.	PAPER TITLE	Type of Course	Periods Per Week (L+T)/P	Credits	Sessional Marks/ Continuous Evaluation	Final Marks	Total Marks
<b>First Semester</b>							
CSA1001	Mathematical and Statistical Foundation of Data Science	C	3+1	4	30	70	100
CSA1002	Data Science & AI	C	3+1	4	30	70	100
CSA1003	Problem solving using Python	C	3+1	4	30	70	100

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CSA1004	DBMS and Data Mining	C	3+1	4	30	70	100
CSA1005	Knowledge Representation & Reasoning	C	3+1	4	30	70	100
CSA10P1	Laboratory Course -I	C	6	4	40	60	100
CSA10P2	Laboratory Course -II	C	6	4	40	60	100
<b>Total</b>				<b>28</b>			<b>700</b>

**Second Semester**

CSA2001	Design and Analysis of Algorithms	C	3+1	4	30	70	100
CSA2002	Cloud Computing & Machine Learning	C	3+1	4	30	70	100
EL-1	Elective-I	C	3+1	4	30	70	100
EL-2	Elective-II	C	3+1	4	30	70	100
OE	Open Elective**	OE	3+1	4	30	70	100
CSA20P1	Laboratory Course -I	C	3+1	4	40	60	100
CSA20P2	Laboratory Course -II	C	6	4	40	60	100
<b>Total</b>				<b>28</b>			<b>700</b>

**Third Semester**

CSA3001	Advanced Machine Learning	C	3+1	4	30	70	100
CSA3002	Big Data with Hadoop	C	3+1	4	30	70	100
CSA3004	Information Retrieval	C	3+1	4	30	70	100
EL-3	Elective-III	C	3+1	4	30	70	100
EL-4	Elective-IV	C	3+1	4	30	70	100
CSA30P1	Laboratory Course-I	C	3+1	4	40	60	100
CSA30P2	Laboratory Course-II	C	6	4	40	60	100
<b>Total</b>				<b>28</b>			<b>700</b>

**Fourth Semester**

CSA4001	Research Project	A		12	40	60	100
<b>Total</b>				<b>12</b>			<b>100</b>

Lecture; \*T - Tutorial; \*P - Practical/Lab; \*D - Dissertation/Project;

**Course Categories and Credits allotted**

▪ The courses mentioned in above curriculum are of following categories.

S. No	Course Categories	Code	Credits Allotted
1	Core	C	64
2	Elective (Discipline Centric)	E	16
3	Ability Enhancement (Discipline Centric)	A	12
4	Ability Enhancement (Open elective)	OE	4
<b>Total Credits</b>			<b>96</b>

**st of Electives**

Students are required to select one course from each set of electives (EL-1 to EL-4) offered by the department from time-to-time.

Electives	Course No.	Paper Title	Course No.	Paper Title
EL-1 (Credit-2)	CSA2051	Linear Algebra and Its applications in Data Science	CSA2052	Computational Intelligence
EL-2 (Credit-4)	CSA2061	Distributed Computing	CSA2063	Task Partitioning and Load Balancing in Cloud Computing
EL-3 (Credit-4)	CSA3051	Natural Language Processing	CSA3052	Expert Systems
EL-4 (Credit-4)	CSA3061	Soft Computing	CSA3062	Pattern Recognition

\*\*Students of the department of Computer Science are required to opt any Open Elective course offered by other departments of faculty of Science, in Second Semester preferably Mathematics, Statistics & OR, GIS, etc.

\*\*\*CSD4491 (Open Elective): Fundamentals of IT (For fourth semester students of Faculty of Science other than Computer Science).





Department of  
Statistics & Operations Research  
ALIGARH MUSLIM UNIVERSITY  
ALIGARH - 202002

CHAIRMAN

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D.No. 426/81  
Dated: 28.11.2020  
01.12.20

The Dean  
Faculty of Science  
AMU, Aligarh.

Enclosed please find herewith three copies of minutes of Board of Studies held 24.11.2020 at 12.00 noon (ONLINE) of Department of Statistics and Operations Research for information and necessary action at your end.

*Athar Ali Khan*  
1-12-20  
(Prof. Athar Ali Khan)  
CHAIRMAN

Encl.: As above

Chairman :  
Dept. of Statistics & O.R.  
A.M.U., Aligarh

✓  
S.O/MR Ghayas/ A.R Academic

*Oyad*  
DEAN  
Faculty of Science  
A.M.U., Aligarh

*On 2/11/2020*

Minutes

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Special meeting of the Board of Studies of the Department of Statistics & Operations Research held ONLINE on 24.11.2020 at 12.00 noon.

The following members were present:

<u>S.No.</u>	<u>Name</u>	
1	Prof. Athar Ali Khan	(in the chair)
2	Prof. Nizamuddin Khan, D/o Geography	(online) (Assigned Member)
3	Prof. Aquil Ahmed	(online)
4	Dr. Rafiqullah Khan	
5	Dr. Bushra Husain	(online)
6	Dr. Haseeb Athar	
7	Dr. Shakeel Javaid	
8	Dr. Mohd. Jahangir Sabbir Khan	
9	Dr. Ahmad Yusuf Adhami	
10	Dr. Zaki Anwar	
11	Dr. Mohd. Faizan	
12	Dr. Irfan Ali	
13	Dr. Yasmin Khan	(online)
14	Dr. Ahmadur Rahman	
15	Dr. Mohammad Azam Khan	
16	Dr. Fatima Siddiqui	
17	Dr. Sheema Sadia	(online)
18	Dr. Romana Shehla	(online)
19	Dr. Mohd. Khalid	


Then the following items on the agenda were considered and decisions taken:

Item No.1 : Considered and approved the list of Examiners, Moderators and Re-evaluators (Odd Semester) for the following examinations for the session 2020-21 to be sent to the Deputy Controller (Confidential Unit) through Dean, Faculty of Science under sealed cover. However, the Chairman, Department of Statistics & O.R. has been authorised to make necessary changes, if needed. Please see in Appendix A.

- B.A./B.Sc. I, III & V Semester
- M.A./M.Sc. (Statistics) I & III Semester
- M.A./M.Sc. (Operations Research) I & III Semester

Item No. 2: Considered and approved the introduction of M.Sc (Data Science).

At the end of the meeting, the Chairman thanked all members for the cooperation in holding the meeting.

  
 (Prof. Athar Ali Khan)  
 Chairman  
 Dept. of Statistics & O.R.  
 A.M.U., Aligarh



