DEPARTMENT OF MATHEMATICS
BIRLA INSTITUTE OF TECHNOLOGY
MESRA: RANCHI

Date: 16/11/2021

Ref.- Dept/Math/2021-2022/79

To.

The Dean (UG)

BIT, Mesra, Ranchi

Sub: Submission of revised CBCS course structure and BOS minutes for your approval.

Dear Sir,

Please find the attached herewith the revised CBCS Coures structure and minutes of the meeting 16.11.2021.

Thanking you,

Yours Sincerely;

(Dr. S. Padhi)

Chairman, BOS

Prof. & Head

BIRLA INSTITUTE OF TECHNOLOGY
MESRA: RANCHI

Date: 16/11/2021

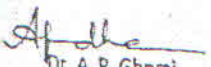Ref: - Dept /Math/2021-2022/78

MINUTES OF THE BOS MEETING

A meeting of the Board of Studies (BOS) members was held at 2:00 PM on 16.11.2021 by virtual mode. The BOS members rigorously discussed and approved the revised course structure for IMSc. (Mathematics and Computing), and the revision of MA108 (Mathematics III) & MA207 (Mathematics IV) to MA108R1 (Mathematics III) and MA207R1 (Mathematics IV) by adding course contents less than 10%. The revision of MA108 &MA207 are carried out as per the requirements of Dept. of Physics. & Dept. of Chemistry dept. for their IMSc. students.

Prof. S. K. Jain
(Member)

Prof. S. Chakraborty
(Member)

Prof. S. Konar
(Member)
Dept. of Physics
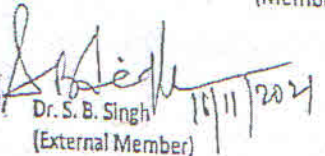
Prof. G. K. Panda
(External Member)
Dept. of Mathematics
NIT, Rourkela

Dr. A. P. Ghorai
(Member)
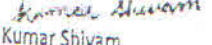
Dr. A. Tandon
(Member)

Dr. P. Kaur
(Member)

Dr. A. Mustafi
(Member)
Dept. of Comp. Sc. & Engg.

Dr. S. B. Singh
(External Member)
Asso. Prof. Biostat, PSM,
RIMS, Ranchi

Nishith Mohan
(Member Alumni) ,Research scholars
Dept. of Mathematics, IIT Mandi,
Himachal Pradesh 175005
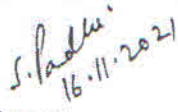
Kumar Shivam
(Member Alumni)
Data Scientist Flipshope
Bengaluru, Karnataka 560102

Nimish Tiwari
(Member Student)
IMSc. (Maths & Computing)
3rd Year (VIth Semester

Swapnil Kant
(Member Student)
IMSc. (Maths & Computing)
4th Year (VIIIth semester)

Peeyush Tewari
(Inv. Member)

Dr. Prabal Datta
(Inv. Member)

(Prof. S. Padhi)
Chairman, BOS
Department of Mathematics
Prof. & Head,

Copy to
1. PS to VC
2. Registrar
3. Dean AP
4. All Members

BIRLA INSTITUTE OF TECHNOLOGY
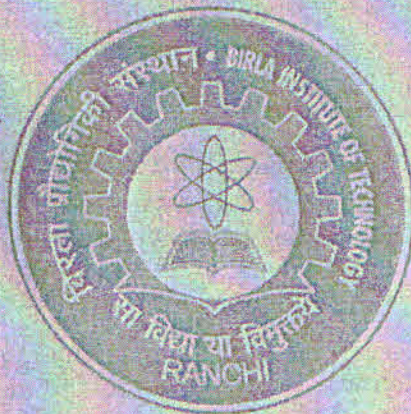
CHOICE BASED CREDIT SYSTEM (CBCS) CURRICULUM
(Effective from Academic Session: Monsoon 2021)

PROGRAMME
5 Years Integrated Master of Science in Mathematics and Computing

Department of Mathematics

Institute Vision

To become a Globally Recognized Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research, and technological service to the National needs.

Institute Mission

- To educate students at Under Graduate, Post Graduate, Doctoral, and Post-Doctoral levels to perform   challenging engineering and managerial jobs in industry.
- To provide excellent research and development facilities to take up Ph.D. programmes and research
    projects.

- To develop effective teaching learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education, and research in emergingareas.
- To provide excellent technological services to satisfy the requirements of the industry and overall
academic needs of society.

Department Vision

- To become a globally recognized centre of excellence in teaching and research, producing excellent academicians, professionals and innovators who can positively contribute towards the
    society.

Department Mission

- Imparting strong fundamental concepts to students in the field of Mathematical Sciences and motivate them towards innovative and emerging areas of research.
- Creation of compatible environment and provide sufficient research facilities for undertaking   quality
    research to achieve global recognition.

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CBCS based Syllabus for IMSc in Mathematics and Computing
(1st -10th Semester)

Important notes:

> The basic criteria of UGC have been followed in preparing the course structure of this programme.
> The Exit option with B.Sc. Honours in Mathematics and Computing can be offered to them who want to get it after successful completion of 6th semester.
> Otherwise IMSc in Mathematics and Computing would be offered to them after the successful completion of 10th semester.

Graduate Attributes

1. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems
reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3. **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4. **Conduct investigations of complex problems** using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
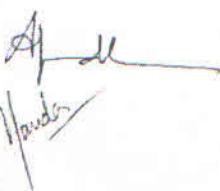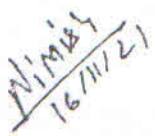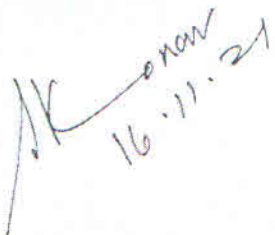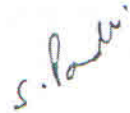
7. **Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11. **Project Management and Finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long Learning**: Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

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Program Educational Objectives (PEOs)

1. To impart conceptual knowledge of Mathematical Sciences for formulating and analyzing the real-world problems with futuristic approach.
2. To equip the students sufficiently in both analytical and computational skills in Mathematical Sciences.
3. To develop a competitive attitude for building a strong academic - industrial collaboration, with focus on continuous learning skills.
4. To nurture and nourish strong communication and interpersonal skills for working in a team with high moral and ethical values.

A) Programme Outcomes (POs)

A graduate of this program is expected to:

1. gain sound knowledge on fundamental principles and concepts of Mathematics and computing with their applications related to Industrial, Engineering, Biological and Ecological problems.
2. exhibit in depth the analytical and critical thinking to identify, formulate and solve real world problems of science and engineering.
3. be proficient in arriving at innovative solution to a problem with due considerations to society and environment.
4. be capable of undertaking suitable experiments/research methods while solving the real life problem and would arrive at valid conclusions based on appropriate interpretations of data and experimental results.
5. exhibit understanding of societal and environmental issues (health, legal, safety, cultural etc) relevant to professional practice and demonstrate through actions, the need for sustainable development
6. be committed to professional ethics, responsibilities and economic, environmental, societal and political norms.
7. demonstrate appropriate inter-personal skills to function effectively as an individual, as a member or as a leader of a team and in a multi-disciplinary setting.
8. develop written and oral communications skills in order to effectively communicate design, analysis and research results.
9. be able to acquire competent positions in industry and academia as well.
10. be able to acquire lifelong learning and continuous professional development.
11. be conscious of financial aspects of all professional activities and shall be able to undertake projects with appropriate management control and control on cost and time.
12. recognize the need for continuous learning and will prepare himself/ herself appropriately for his/her all-round development throughout the professional career.

(B) Programme Specific Outcomes (PSOs)

13. Apply in-depth knowledge gained during the Integrated MSc. Mathematics and Computing program in analyzing and interpreting real life problems for providing the optimal and achievable solutions.

14. Demonstrate combined knowledge of mathematics and computing to manage projects efficiently and economically with intellectual integrity and ethics for sustainable development of society.

15. Capable of using his/her knowledge of mathematical sciences in higher studies of interdisciplinary nature.

BIRLA INSTITUTE OF TECHNOLOGY- MESRA, RANCHI
REVISED COURSE STRUCTURE
(To be effective from academic session MO-2021)
Based on CBCS system & OBE model Recommended scheme of study
(*For Integrated MSc. in Mathematics and Computing*)

Course Structure Semester-wise:

Semester-I	Semester-II
MA 101 Calculus-I(C-1)	MA 105 Calculus-II (C-4)
MA 102 Real Analysis (C-2)	MA 106 Ordinary Differential Equations (C-5)
MA 109 Matrix Theory (C-3)	MA 110 Complex Analysis (C-6)
CH 111 Chemistry –I (GE-1) CH 112 Chemistry –I Lab (GE-1)	PH 109 Physics –I(GE-2) PH 110 Physics –I Lab (GE-2)
~~Business~~ Communications -I (AECC-1) ~~MA~~ MT 132 Comm. Skills I	CE 101 Environmental Science (AECC-2)
MC 101/102/103/104 NCC/NSS/ PT & Games / Creative Arts	CS 101 Programming for problem solving(SEC-1) CS 102 Programming for problem solving Lab (SEC-1)
	MC 105/106/107/108 NCC/NSS/ PT & Games / Creative Arts

Semester-III	Semester-IV
MA 201 Partial Differential Equations (C-7)	MA 311 Numerical Techniques (C-15) MA 319 Computational Lab.(MAT Lab/ Mathematica etc.(SEC-2)
MA 202 Modern Algebra (C-8)	MA 206 Linear Algebra (C-12)
MA 208 Integral Transforms and its Applications (C-9)	CS 204 Object Oriented Programming and Design Pattern (C-13) CS 205 Object Oriented Programming and Design Pattern Lab (C-13)
CS 201 Data Structure (C-10) CS 202 Data Structure Lab (C-10)	CH 213 Chemistry –II (GE-4) CH 214 Chemistry –II Lab (GE-4)
PH 111 Physics –II(GE-3) PH 112 Physics –II Lab (GE-3)	MA209 Integral equations and Greens function/ MA 304 Tensor Analysis/ MA306 Special Functions (DSE-1)
MC 201/202/203/204 NCC/NSS/ PT & Games / Creative Arts	MC 205/206/207/208 NCC/NSS/ PT & Games / Creative Arts

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Semester-V	Semester-VI
MA 301 Probability and Statistics (C-14) MA 302 Probability and Statistics Lab(C-14) MA 205 Discrete Mathematics (C-11)	MA 309 Optimization Techniques (C-18) MA 310 Optimization Techniques Lab (C-18) CS 301 Database Management System(C-19) CS 302 Database Management System Lab(C-19)
~~Business Communication - II (AECC-3)~~ MTL33 Comm. Skills II (AECC-3) CS 206 Design and Analysis of Algorithm (C-16) CS 207 Design and Analysis of Algorithm Lab (C-16) CS 310 Formal Languages & Automata Theory (C-17)	CS 303 Operating Systems(C-20) MA307 Computational Linear Algebra/ MA308 Difference equations /CS 321 Soft Computing/ CS 391 Introduction to Distributed System MA317 Wavelet Transform / MA 318 Artificial Network / IT 322 Cloud Computing/CS 325 Database Modelling/ CS 324System programming (DSE-3) (any two)
MA303 Fuzzy Logic /MA305 Graph Theory/ MA 315 Financial Mathematics / MA 313 Combinatorics/ MA 314 Fuzzy Set Theory and its application/ MA 316 Statistics Quality Control and Reliability (DSE-2) (any two)	~~MA33~~ Dissertation MA300 (Pure Mathematics/ Applied Mathematics/ Computer Science) (DSE-4)

Semester-VII	Semester-VIII
MA 401 Real Analysis and Measure Theory (C-21) MA 402Advanced Complex Analysis(C-22)	MA412 Topology (C-25) MA413 Stochastic Process and Simulation (C-26)
CA505 Software Engineering (C-23) CA506 Software EngineeringLab. (C-23)	MA414 Advanced Operation Research (C-27) MA415 Advanced Operation Research Lab. (C-27)
CA603 System Simulation and Modeling (C-24)	CA559 Data Communications and Computer Networks (C-28) CA560 Data Communications and Computer Networks Lab. (C-28)
MA404 Mathematical Epidemiology/MA405 Mathematical Modelling/ MA406 Fuzzy Mathematical Programming/ MA407 Survey Sampling/MA408 Theory of Elasticity/ MA409	MA416 Statistical Inference/ MA418 Mechanics/ MA419 Mathematical Ecology/ MA427 Multiple Criteria Decision Making/CA584 Web Programming/CA640 Machine Learning (DSE-6)

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Design of Experiments MA410 Differential Geometry/ CA532 Data Mining and Warehousing (DSE-5) (any two) Open Elective (OE-I)	Open Elective (OE-II)

Semester-IX	Semester-X
MA501 Functional Analysis(C-29)	MA509 Research Project / Industry Internship (RP-1)
MA502 Number Theory(C-30)	
CA601 Computer Graphics(C-31) CA602 Computer Graphics Lab. (C-31)	
MA503 Statistical Computing/MA504 Finite Element Methods/MA505 Calculus of Variations and Optimal Control/MA506 Advance Difference Equations/ MA507 Computational Fluid Dynamics/ MA508 Qualitative Theory of Differential Equations/ CA630 Cryptography and Network Security/ CA635 Natural Language Processing(DSE-7) (any two)	
MT204 Constitution of India (MC)	

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BIRLA INSTITUTE OF TECHNOLOGY- MESRA, RANCHI
NEWCOURSE STRUCTURE - To be effective from academic session MO-2021
Based on CBCS system & OBE model
Recommended scheme of study
(For Integrated MSc. in Mathematics and Computing)

UG Program (1st - 6th Semester)

Semester/ Session of Study	Level	Category of course	Course Code	Subjects	Mode of delivery & credits L-Lecture; T-Tutorial; P-Practicals			Total Credits C- Credits
					L (Periods /week)	T (Periods /week)	P (Periods /week)	C (Credits)
				THEORY				
FIRST Monsoon	1	CC Core Course	MA101	Calculus-I	3	1	0	4
			MA102	Real Analysis	3	1	0	4
			MA109	Matrix Theory	3	1	0	4
		AECC (Ability Enhancement Compulsory Course	MT132	~~Business~~ Communication - Skills - I	0	0	3	1.5
		GE (Generic Elective)	CH111	Chemistry –1	3	1	0	4
				LABORATORIES				
	1	GE	CH112	Chemistry –1 Lab	0	0	4	2
		MC Mandatory Course	MC 101/102/ 103/104	Choice of: NCC/NSS/PT & Games / Creative Arts (CA)	0	0	2	1
				TOTAL				20.5
				THEORY				
SECOND Spring	1	CC	MA105	Calculus-II	3	1	0	4
			MA106	Ordinary Differential Equations	3	1	0	4

				L	T	P	Credits
		MA110	Complex Analysis	3	1	0	4
	GE	PH109	Physics I	3	1	0	4
	AECC	CE101	Environmental Science	2	0	0	2
	SEC (Skill Enhancement Course)	CS101	Programming for problem solving	3	1	0	4
LABORATORIES							
	GE	PH110	Physics I Lab	0	0	4	2
1	SEC	CS102	Programming for problem solving Lab	0	0	3	1.5
	MC	MC 105/106/107/108	Choice of: NCC/NSS/PT & Games / Creative Arts (CA)	0	0	2	1
TOTAL							26.5
GRAND TOTAL FOR FIRST YEAR							47
THEORY							
		MA201	Partial Differential Equations	3	1	0	4
		MA202	Modern Algebra	3	1	0	4
2	CC	MA208	Integral Transforms and its Applications	3	1	0	4
		CS201	Data Structure	3	1	0	4
1	GE	PH111	Physics –II	3	1	0	4
LABORATORIES							
2	CC	CS202	Data Structure Lab	0	0	3	1.5
1	GE	PH112	Physics –II Lab	0	0	4	2
2	MC	MC 201/202/203/204	Choice of : NCC/NSS/PT & Games/ Creative Arts CA)	0	0	2	1
TOTAL							24.5
THEORY							
FOURTH Spring		MA311	Numerical Techniques	3	1	0	4
2	CC	MA206	Linear Algebra	3	1	0	4

THIRD Monsoon

				L	T	P	C
		CS204	Object Oriented Programming and Design Pattern	3	0	0	3
	GE	CH213	Chemistry II	3	1	0	4
	DSE-1 (Discipline Specific Electives) (Any one from the list)	MA209 /MA30 4/MA3 06	Integral Equations and Green's Function/Tensor Analysis/Special Functions	3	1	0	4

LABORATORIES

				L	T	P	C
	CC	CS205	Object Oriented Programming and Design Pattern Lab	0	0	3	1.5
	GE	CH214	Chemistry II Lab	0	0	4	2
2	SEC	MA319	Computational Lab.(MATLAB/ Mathematica etc.	0	0	3	1.5
	MC	MC 205/206/ 207/208	Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA)	0	0	2	1

TOTAL | | | | | | | | 25

THEORY

					L	T	P	C
FIFTH Monsoon	3		MA301	Probability and Statistics	3	1	0	4
			MA205	Discrete Mathematics	3	1	0	4
	2	CC	CS 206	Design and Analysis of Algorithm	3	0	0	3
	3		CS 310	Formal Languages & Automata Theory	3	0	0	3
		AECC	MT133	~~Business~~ Communications & Skills - II	0	0	3	1.5

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					L	T	P	C
	3	DSE-2 (Any two from the list)	MA303/ MA305/ MA315/ MA313/ MA314/ MA316	Fuzzy Logic/Graph Theory/Financial Mathematics Combinatorics/Fuzzy Set Theory and Its Applications/Statistical Quality Control and Reliability	3	1	0	4 X 2 = 8
				LABORATORIES				
	3	CC	MA 302	Probability and Statistics Lab	0	0	3	1.5
	2		CS 207	Design and Analysis of Algorithm Lab	0	0	3	1.5
				TOTAL				26.5
				THEORY				
		CC	MA309	Optimization Techniques	3	1	0	4
			CS 301	Database Management System	3	0	0	3
			CS 303	Operating Systems	3	0	0	3
SIXTH Spring	3	DSE-3 (Any two from the list)	MA307/ MA308/ CS321/ CS391/ MA317/ MA318/ IT322/ CS325/ CS324	Computational Linear Algebra/Difference Equation/Soft Computing/Introduction to Distributed System/ Wavelet Transform/Artificial Neural Network/ Cloud Computing/Database Modelling/ System programming	3	0	0	3 X 2=6
		DSE-4	~~MA300~~ ~~MA370~~ MA300	Dissertation (Pure Mathematics/ Applied	6	0	0	6

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			Mathematics/ Computer Science)				

LABORATORIES							
		MA 310	Optimization Techniques Lab	0	0	3	1.5
3	CC	CS 302	Database Management System Lab.	0	0	3	1.5
TOTAL							25
Minimum requirement for Degree award of B.Sc. Honours in Mathematics and Computing (1st – 6th Semester)							148

PG Program (7th - 10th Semester)

Semester/ Session of Study (Recommended)	Level	Category of course	Course Code	Subjects	Mode of delivery & credits L-Lecture; T-Tutorial ;P-Practicals			Total Credits C-Credits
					L (Periods/week)	T (Periods/week)	P (Periods/week)	C
THEORY								
SEVENTH Monsoon	4	CC	MA 401	Real Analysis and Measure Theory	3	1	0	4
			MA 402	Advanced Complex Analysis	3	1	0	4
	6		CA603	System Simulation and Modeling	3	0	0	3
	5		CA505	Software Engineering	3	1	0	4
	5	DSE-5 (Any two from the list)	MA404 /MA405/MA406/MA407/ MA408 /MA409/MA410/CA532	Mathematical Epidemiology/Mathematical Modelling/Fuzzy Mathematical Programming/Survey Sampling/ Theory Of Elasticity/Design of Experiments/Differ	3	0	0	3X2=6

3	DSE-2 (Any two from the list)	MA303/ MA305/ MA315/ MA313/ MA314/ MA316	Fuzzy Logic/Graph Theory/Financial Mathematics Combinatorics/Fuzzy Set Theory and Its Applications/Statistical Quality Control and Reliability	3	1	0	4 X 2 = 8
LABORATORIES							
3	CC	MA 302	Probability and Statistics Lab	0	0	3	1.5
2		CS 207	Design and Analysis of Algorithm Lab	0	0	3	1.5
TOTAL							26.5
THEORY							
	CC	MA309	Optimization Techniques	3	1	0	4
		CS 301	Database Management System	3	0	0	3
		CS 303	Operating Systems	3	0	0	3
SIXTH Spring	3	DSE-3 (Any two from the list)	MA307/ MA308/ CS321/ CS391/ MA317/ MA318/ IT322/ CS325/ CS324	Computational Linear Algebra/Difference Equation/Soft Computing/Introduction to Distributed System/ Wavelet Transform/Artificial Neural Network/ Cloud Computing/Database Modelling/ System programming	3	0	0	3 X 2=6
		DSE-4	~~MA300~~ ~~MA330~~ MA300	Dissertation (Pure Mathematics/ Applied	6	0	0	6

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			ential Geometry/Data Mining and Warehousing				
	OE* Open Electives		OE-I	3	0	0	3

LABORATORIES							
5	CC	CA506	Software Engineering Lab	0	0	3	1.5
						TOTAL	25.5

THEORY							
		MA412	Topology	3	1	0	4
4		MA413	Stochastic Processes and Simulation	3	0	0	3
	CC	MA414	Advanced Operation Research	3	1	0	4
4		CA559	Data Communication and Computer Networks	3	1	0	4
4	DSE-6	MA416 /MA41 8/MA4 19/MA 427CA 584/CA 640	Statistical Inference/Mechani cs/Mathematical Ecology/Multiple Criteria Decision Making/Web Programming/Mac hine Learning	3	0	0	3
	OE*		OE-II	3	0	0	3

EIGHTH Spring

LABORATORIES							
4	CC	MA415	Advanced Operation Research Lab.	0	0	3	1.5
5	CC	CA560	Data Communication and Computer Networks Lab.	0	0	3	1.5
						TOTAL	24.0

NINTH Monsoon	THEORY							
	5	CC	MA501	Functional	3	1	0	4

			Analysis				
		MA502	Number Theory	3	1	0	4
6		CA601	Computer Graphics	3	0	0	3
5	DSE-7 (Any two from the list)	MA503/ MA504/ MA505/ MA506/ MA507/ MA508/ CA630/ CA635	Statistical Computing/Finite Element Methods/Calculus of Variations and Optimal Control/Advance Difference Equations/ Computational Fluid Dynamics/Qualitative Theory of Differential Equations/Cryptography and Network Security/ Natural Language Processing	3	0	0	3X2=6

LABORATORIES							
6	CC	CA602	Computer Graphics Lab	0	0	3	1.5
2	MC	MT204	Constitution of India	2	0	0	0
						TOTAL	18.5

TENTH Spring	5	RP Research Project / Industry Internship	MA509	Research Project / Industry Internship	0	0	0	12
							Total	12

Total credits of Integrated M.Sc. in Mathematics and Computing (7th - 10th Semester)	80

Minimum requirement for Degree award of Integrated M. Sc. in Mathematics and Computing (1st - 10th Semester)	228

DEPARTMENT OF MATHEMATICS

PROGRAMME ELECTIVES: DSE OFFERED FOR SEMESTER 4-9

DSE / LEVEL		Prerequisites Subjects with code	Code no.	Name of the DSE subjects	L	T	P	C
DSE-1 IV Sem.	3	MA106, MA201	MA209	Integral Equations and Green's Function	3	1	0	4
		MA106, MA201	MA304	Tensor Analysis	3	1	0	4
		MA105	MA306	Special Functions	3	1	0	4
DSE-2 V Sem.	3		MA303	Fuzzy Logic	3	1	0	4
		MA205	MA305	GraphTheory	3	1	0	4
		MA301	MA315	Financial Mathematics	3	1	0	4
		MA205	MA313	Combinatorics	3	1	0	4
		MA303	MA314	Fuzzy Set Theory and its applications	3	1	0	4
		MA301	MA316	Statistical Quality Control and Reliability	3	1	0	4
DSE-3 VI Sem.	3	MA106, MA201	MA307	Computational Linear Algebra	3	0	0	3
		MA106, MA201	MA308	Difference Equations	3	0	0	3
			CS391	Introduction to Distributed System	3	0	0	3
		MA205	CS321	Soft Computing	3	0	0	3
		MA106	MA317	Wavelet Transform	3	0	0	3
		MA102, MA105	MA318	Artificial Neural Network	3	0	0	3
			IT322	Cloud Computing	3	0	0	3
		CS301	CS325	Database Modelling	3	0	0	3
		NIL	CS324	Systems Programming				
DSE-4 VI Sem.	3	---	MA320	Dissertation (Pure Mathematics/ Applied Mathematics/ Computer Science)	6	0	0	6

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DSE-5 VII Sem.	4	MA106, MA201	MA404	Mathematical Epidemiology	3	0	0	3
		MA106, MA201	MA405	Mathematical Modelling	3	0	0	3
		MA205	MA406	Fuzzy Mathematical Programming	3	0	0	3
		MA301	MA407	Survey Sampling	3	0	0	3
	4	MA106, MA201	MA408	Theory of Elasticity	3	0	0	3
		MA301, MA407	MA409	Design of Experiments	3	0	0	3
		MA105	MA410	Differential Geometry	3	0	0	3
	5		CA532	Data Mining and Warehousing	3	0	0	3
DES-6 VIII Sem..	4	MA301	MA416	Statistical Inference	3	0	0	3
		MA106, MA201	MA418	Mechanics	3	0	0	3
		MA106, MA201	MA419	Mathematical Ecology	3	0	0	3
		MA309, MA414	MA427	Multiple-Criteria Decision Making	3	0	0	3
	5		CA584	Web Programming	3	0	0	3
	6	CS206	CA640	Machine Learning	3	0	0	3
DSE-7 IX Sem.	5	MA301	MA503	StatisticalComputing	3	0	0	3
		MA106, MA201	MA504	Finite Element Methods	3	0	0	3
		MA106, MA201, MA309	MA505	Calculus of Variations and Optimal Control	3	0	0	3
		MA106, MA201	MA506	Advanced Difference Equations	3	0	0	3
	5	MA106, MA201	MA507	Computational Fluid Dynamics	3	0	0	3
		MA106, MA201	MA508	Qualitative Theory of Differential Equations	3	0	0	3

	6	CA630	Cryptography & Network Security	3	1	0	4
		CA635	Natural Language Processing	3	0	0	3

BIRLA INSTITUTE OF TECHNOLOGY- MESRA, RANCHI
Revised COURSE STRUCTURE - To be effective from academic session MO-2021
Based on CBCS system & OBE model
Recommended scheme of study

Details of credits distribution for IMSc. in Mathematics and Computing (category wise)

UG Program (1st - 6th Semester)		
S.No	Category	Credits
1	CC- Core Courses (Mathematics & Computer Science)	84
2	AECC (Ability Enhancement Compulsory Course	5
3	SEC (Skill Enhancement Course)	7
4	GE (Generic Elective)	24
5	DSE-Discipline Specific Electives (Mathematics & Computer Science)	24
7	MC- Mandatory Course: NCC/NSS/Creative Arts/ PT & Games	4
	TOTAL	148

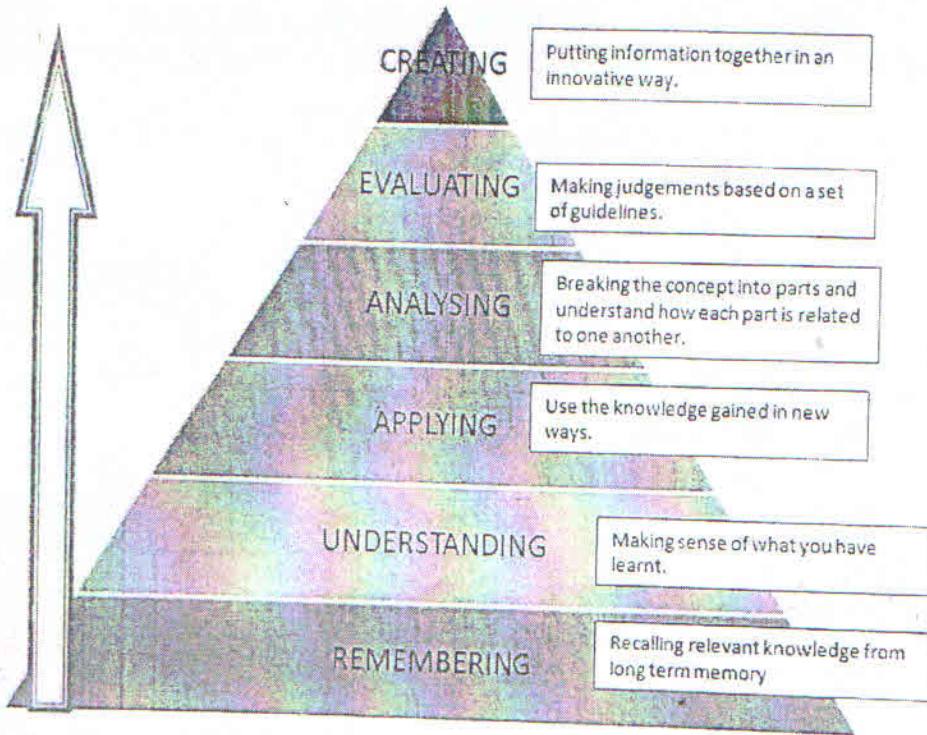| PG Program (7th -10th Semester)		
S.No	Category	Credits
1	CC- Core Courses (Mathematics & Computer Science)	47
2	DSE-Discipline Specific Electives (Mathematics & Computer Science)	15
3	OE-Open Electives	6
4	Research Projects	12
5	MC- Mandatory Course (Constitution of India)	0
	TOTAL	80
Program total Credits for IMSc. in Mathematics and Computing: 148(UG)+80(PG) = 228 Credits		

BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:
Preamble

16.11.2021

The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.

CREATING — Putting information together in an innovative way.

EVALUATING — Making judgements based on a set of guidelines.

ANALYSING — Breaking the concept into parts and understand how each part is related to one another.

APPLYING — Use the knowledge gained in new ways.

UNDERSTANDING — Making sense of what you have learnt.

REMEMBERING — Recalling relevant knowledge from long term memory

16.11.2021

S. Padu

Nimish
16/11/21

Manav
16.11.21

Pravir P Dutta

Senthil Chandra
Jain