2 year Master of Science (MS) Programme

IISER Thiruvananthapuram

Introduction

The national education policy 2020 envisages flexible and diverse academic programmes in higher education institutions allowing students to enter and exit each programme at various levels, obtaining commensurate credentials. The two year Master of Science (MS) programme of IISER Thiruvananthapuram is positioned in a manner that it bridges the flagship, five-year BS-MS programme of the institute with the PhD programme. The MS programme will extend the training in science set in a vibrant research environment that is the signature of IISERs to bright undergraduate students selected competitively from across the country. The MS programme is expected to feed into the PhD programme of the institute while encouraging the students to take up further studies that leads to a career in scientific research, development, innovation and teaching.

Regulations and Guidelines

Admission

Admission to the MS programme will be through two channels:

1. Applicants with valid scores in national level tests like JAM, JEST, JGEEBILS etc., selected by each school through interviews.
2. Applicants may also appear for national level online screening tests in each subject conducted by IISER TVM. Selection from the candidates shortlisted on the basis of the screening test will be through interviews conducted by the respective schools.

Admissions to the MS programme will follow all applicable reservation rules of the government of India.

Fellowship

Students admitted to the MS programme will not be eligible for any fellowship from the institute.

Degree requirements

1. Each student must acquire a minimum of 66 credits with a CGPA of 5.0 or higher for graduating from the MS programme.
2. All courses designated as CORE by the respective schools must be successfully completed.
3. Successful completion of 12 research project credits is mandatory for obtaining the MS degree.
4. No disciplinary action must be pending against the student.

Course structure and course codes

The MS programmes of all the four schools have the following common structure:

CORE courses	:	42 to 48 Credits
Elective courses	:	12 to 16 Credits
Project	:	12 Credits

Each school will require up to two electives to be mandatorily taken from the same subject while the remaining may be chosen by the student from among the open electives offered by the other schools, bringing in flexibility and an inter-disciplinary flavor into the MS course structure.

CORE courses for the MS programme in each subject will run under a separate course number even if the name and content is identical to corresponding BS-MS/I-PhD/PhD courses. MS students will attend the

classes along with the students from the other streams but only those students taking the course under the same course number will be graded relative to each other. ELECTIVE courses however will run under a single common course number.

The CORE courses of the MS programme are numbered in the format

MSQ LSC (LTPC)

ELECTIVE courses are numbered in the format:

XYZ LSCD (LTPC)

CORE/ELECTIVE MODULES carrying less than 3 credits are numbered as

MSQ/XYZ LSC*m* (LTPC) or MSQ/XYZ LSC*mn* (LTPC)

The numbering may be understood as

MS	:	Prefix common to all 2 year MS courses distinguishing them from corresponding BS-MS/I-PhD/PhD courses.
Q	:	Programme code (B-Biology, C-Chemistry, M-Mathematics, P-Physics)
XYZ	:	Programme/Subject code for elective courses
L	:	Level of the course (1, 2, 3, 4, 5 or 6)
S	:	Semester (1-Varsha, 2-Vasanth)
C (CD)	:	Course number
m (mn)	:	Module position – Applicable only to 1 and 2 credit modules *a* : Module spans 1st one-thirds of the semester (12 to14 lectures) *b* : Module spans 2nd one-thirds of the semester (12 to14 lectures) *c* : Module spans 3rd one thirds of the semester (12 to14 lectures) *ab* : Module spans 1st two-thirds of the semester (24 to 28 lectures) *bc* : Module spans 2st two-thirds of the semester (24 to 28 lectures)
L	:	Lecture hours per week
T	:	Tutorial hours per week
P	:	Practical (laboratory) hours week
C	:	Credits

Subject/Programme codes (XYZ)

BIO	:	Biological Sciences	CHY	:	Chemical Sciences
MAT	:	Mathematical Sciences	PHY	:	Physical Sciences
IDC	:	Interdisciplinary Studies	HUM	:	Humanities
DSC	:	Data Sciences	I2B	:	i^2 Biological Sciences
I2C	:	i^2 Chemical Sciences	I2D	:	i^2 Data Sciences
I2M	:	i^2 Mathematical Studies	I2P	:	i^2 Physical Sciences

Project work and evaluation

Each student will have the option of accumulating the 12 mandatory project credits in two ways:

1. Register for the 3 credit project course of the corresponding school during the 3rd (odd) semester and then follow it up by registering for the 9 credit project course of the school during the 4th (even) semester. This option is conditional upon a faculty member from the respective school agreeing to guide the student for a year-long project.

2. Register for the 12 credit project course of the corresponding school during the 4th (even) semester leading to a short (one semester long) project.

The year-long project option involves registering for the 3rd semester project course replacing an elective. The elective credits not registered for in the 3rd semster must be earned back in the 4th semester.

Each designated project course that the student registers for will be evaluated independently

Rules and regulations common to MS and BS-MS programmes

The following sections of the BS-MS guidebook of rules and regulations (2021-22) apply as-is to the MS programme also and hence they are not repeated in this note placed before the senate:

1. Registration
2. Assessment and Grading
3. Class committee
4. Essentials for completing courses
5. Conduct and Discipline

Course structure and Electives

Master of Science in Biological Sciences

Structure of the Programme

<table>
<tr><th>Semester I</th><th>Semester II</th><th>Semester III</th><th>Semester IV</th></tr>
<tr><td>MSB 311 [3003]
Advanced Microbiology</td><td>MSB 321 [2002]
Structural Biology</td><td>MSB 411 [3003]
Developmental Biology</td><td colspan="2">MSB 421 [2002]
Bioinformatics</td></tr>
<tr><td>MSB 312 [3003]
Genetics & Genome Biology</td><td>MSB 322 [3003]
Immunology</td><td>MSB 412 [2002]
Biostatistics</td><td colspan="2">Elective - V [3003]
(School/Open)</td></tr>
<tr><td>MSB 313 [3003]
Physiology</td><td>MSB 323 [3003]
Cell Biology</td><td>MSB 413 [0093]
Adv. Biology Lab - III</td><td rowspan="4">MSB 428 [9009] Project
OR
MSB 429 [120012] Project Phase -II</td><td rowspan="4"></td></tr>
<tr><td rowspan="2">MSB 314 [3003]
Biochemistry</td><td rowspan="2">MSB 324 [3003]
Molecular Biology</td><td>MSB 414 [0001]
Seminar</td></tr>
<tr><td>Elective - II [3003] (School)</td></tr>
<tr><td>MSB 315 [3003]
Evolutionary Ecology</td><td>MSB 325 [0093]
Adv. Biology Lab - II</td><td>Elective - III [3003]
(School/Open)</td></tr>
<tr><td>MSB 316 [0093]
Adv. Biology Lab – I</td><td>Elective - I [3003]
(School)</td><td>Elective-IV* [3003] (School)
OR
MSB 418* [3003] Project Phase -I</td><td colspan="2"></td></tr>
<tr><td>Core = 18</td><td>Core = 14
Elective = 3</td><td>Core = 9
Elective = 6/9
Project = 3/0</td><td colspan="2">Core = 2
Elective = 3
Project = 9/12</td></tr>
<tr><td>18</td><td>17</td><td>18</td><td colspan="2">14/17</td></tr>
</table>

Credit Distribution

Semester - I						**Semester - II**					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSB 311	Advanced Microbiology	3	0	0	3	MSB 321	Structural Biology	2	0	0	2
MSB 312	Genetics & Genome Biology	3	0	0	3	MSB 322	Immunology	3	0	0	3
MSB 313	Biochemistry	3	0	0	3	MSB 323	Cell Biology	3	0	0	3
MSB 314	Physiology	3	0	0	3	MSB 324	Molecular Biology	3	0	0	3
MSB 315	Evolutionary Ecology	3	0	0	3	MSB 325	Advanced Biology Lab - II	0	0	9	3
MSB 316	Advanced Biology Lab - I	0	0	9	3	BIO3201/ 4216/ OE	Elective - I	3	0	0	3
Total		15	0	9	18	**Total**		14	0	9	17

Cumulative Credits at the End of First Year: 35 (Summer Internship in industry/R&D organization)

Semester - III						Semester - IV					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSB 411	Developmental Biology	3	0	0	3	MSB 421	Bioinformatics	3	0	0	2
MSB 412	Biostatistics	2	0	0	2	BIO 4201 – BIO 4216	Elective – V/OE	3	0	0	3
MSB 413	Advanced Biology Lab - III	0	0	9	3	MSB 429	Project	0	0	0	12
MSB 414	Seminar	0	0	0	1						
BIO 4101 - BIO 4115	Elective – II/OE	3	0	0	3						
BIO 4101 – BIO 4115	Elective – III/OE	3	0	0	3	MSB 428	Project Phase - II	0	0	0	9
BIO 4101 – BIO 4115	Elective - IV/OE	3	0	0	3						
MSB428	Project Phase - I	0	0	0	3						
Total		14	0	0	18	**Total**		6	0	0	14/17
Cumulative Credits at the End of Second Year: 67/70											

Partial list of electives

Course Code	Course Title
BIO3201/BIO4216	Genome Stability
BIO4101/BIO4201	Advanced Developmental Biology
BIO4103/BIO4203	Chronobiology
BIO4104/BIO4204	Cancer Biology
BIO4105/BIO4205	Host-Pathogen Interactions
BIO4107/BIO4207	Ecological Interactions
BIO4108/BIO4208	Stem Cells and Regenerative Medicine
BIO4109/BIO4209	Advances in Plant Biology
BIO4110/BIO4210	Cryo-Electron microscopy and 3D image processing for Life sciences
BIO4111/BIO4211	Biosafety and Regulation
BIO4112/BIO4212	Scientific Writing
BIO4113/BIO4213	Animal Behaviour
BIO4114/BIO4214	Bacterial Genetics

Master of Science in Chemical Sciences

Structure of the programme

Semester 1	Semester 2	Semester 3	Semester 4
MSC 311: Coordination Chemistry	MSC 321: Organometallic Chemistry	MSC 411: Main Group Chemistry	MSC 422: Physical Organic Chemistry
MSC 312: Organic Chemistry – Reactions and mechanisms	MSC 323: Organic Chemistry – Synthetic methods	MSC 413: Chemical and Statistical Thermodynamics	Elective V (Credits 3/2)
MSC 313: Quantum Chemistry	MSC 324: Theoretical Spectroscopy	MSC 414: Chemical Kinetics and Dynamics	MSC 429: Project (12 Credits OR MSC 428: Project (9 Credits) / Elective VI (Credits 3/2)
MSC 314: Physical Chemistry II	MSC 421: Instrumental Methods for Structure determination	Elective III (Credits 3/2) OR MSC 418: Project (3 Credits)	
MSC 315: Organic Chemistry Lab	MSC 325: Inorganic Chemistry Lab	MSC 415: Physical Chemistry Lab	
Elective I (Credits 2) Biosystems MSC XXX / Mathematics for Chemistry MSC XXX	Elective II (Credits 3/2) (*Incl.* CHY 322 Solid State Chemistry)	Elective IV (Credits 3/2) (*Incl.* CHY 412 Advanced Organic Chemistry)	
17	17-18	16-18	16-18

Credit Distribution

Semester - I						Semester - II					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSC 311	Coordination Chemistry	3	0	0	3	MSC 321	Organometallic Chemistry	3	0	0	3
MSC 312	Organic Chemistry - Reactions and mechanisms	3	0	0	3	MSC 323	Organic Chemistry - Synthetic methods	3	0	0	3
MSC 313	Quantum Chemistry	3	0	0	3	MSC 324	Theoretical Spectroscopy	3	0	0	3
MSC 314	Physical Chemistry II	3	0	0	3	MSC 421	Instrumental Methods for Structure determination	3	0	0	3
CHY ####	Elective I	2	0	0	2	CHY ####	Elective II/OE	3-4	0	0	2-3
MSC 315	Organic Chemistry Lab	0	0	9	3	MSC 325	Inorganic Chemistry Lab	3	0	9	3
Total		14	0	9	17	Total		14/15	0	9	17/18
Cumulative Credits at the End of First Year: 34/35 (Summer Internship in industry/R&D organization)											

Semester - III						Semester - IV					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSC 411	Main Group Chemistry	3	0	0	3	MSC 422	Physical Organic Chemistry	3	0	0	3
MSC 413	Chemical and Statistical Thermodynamics	3	0	0	3	MSC ####	Elective – V/OE	2-3	0	0	2-3
MSC 414	Chemical Kinetics and Dynamics	3	0	0	3	MSC ####	Elective – VI/OE	2-3	0	0	2-3
MSC 415	Physical Chemistry Lab	0	0	9	3	MSC 429	Project	0	0	0	12
CHY ####	Elective – III/OE	2-3	0	0	2-3						
CHY ####	Elective – III/OE	2-3	0	0	2-3	MSC 428	Project Phase - II	0	0	0	9
MSC 428	Project Phase – I	0	0	0	3						
Total		11/15	0	9	16/18	Total		7/9	0	0	16/18
Cumulative Credits at the End of Second Year: 66/71											

Partial list of electives

Course Code	Course Title
CHY 412	Advanced Organic Chemistry
CHY 5102	Modern Organic Synthesis: Advances in Methods and Reagents
CHY 4202	Catalysis in Organic Synthesis
CHY ####	Name Reactions and Rearrangements - Application in Organic Synthesis
CHY ####	Chemistry of Carbohydrates, Amino Acids and Peptides
CHY ####	Chemistry of Heterocyclic Compounds
CHY ####	Chemistry of Natural Products
CHY ####	Basics of Supramolecular Chemistry
CHY ####	Polymer Chemistry
MSC ####	Biosystems
CHY 5103	Computational Chemistry
CHY 510X	Fundamentals of Solution-State NMR Spectroscopy: Principles and
CHY ####	Computational Methods in Chemical Biology
CHY ####	Biophysical Chemistry
CHY ####	Group theory in Chemistry
CHY ####	Advanced Electrochemistry
CHY ####	Mathematics for Chemistry
CHY ####	Basics of Nanoscience
CHY ####	Solid State Chemistry
CHY ####	Frontiers in Inorganic Chemistry
CHY ####	Metals in Biology
CHY ####	Main Group Catalysis
CHY 5101	Advanced Material Chemistry

Master of Science in Mathematical Sciences

Structure of the programme

Semester 1	Semester 2	Semester 3	Semester 4
MSM 311: Real Analysis [3003]	MSM 321: Complex Analysis [3003]	MSM 411: Measure Theory [3003]	MSM 421: Functional Analysis [3003]
MSM 312: Theory of Groups and Rings [3003]	MSM 322: Fields, Modules and Algebras [3003]	MSM 413: Analysis on Manifolds [3003]	MSM 423: Differential Geometry [3003]
MSM 313: Linear Algebra [3003]	MSM 323: General Topology [3003]	MSM 414: Partial Differential Equations [3003]	MAT ####: Dept. Elective/Open Elective/Modules [3003]
MSM 314: Numerical Analysis [3003]	MSM 324: Theory of Ordinary Differential Equations [3003]	MSM 415: Programming and Data Structures [3034]	MAT ####:Dept. Elective/Open Elective/Modules [3003]
MSM 315: Mathematical Statistics+Lab [3034]	MSM 325: Probability Theory and Stochastic Processes [3003]	MAT ####: Dept. Elective/Open Elective/Modules [2002]	MSM 429: Project (12Credits) OR MSM 428: Project (9 Credits)
	MAT ####: Department Electives/Modules [3003]	MAT ####:Elective III (Credits 3/2) OR MSC 418: Project (3 Credits)	
16	18	18	18

Credit Distribution

Semester - I						Semester - II					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSM 311	Real Analysis	3	0	0	3	MSM 321	Complex Analysis	3	0	0	3
MSM 312	Theory of groups and rings	3	0	0	3	MSM 322	Fields, Modules and Algebras	3	0	0	3
MSM 313	Linear Algebra	3	0	0	3	MSM 323	General Topology	3	0	0	3
MSM 314	Numerical Analysis	3	0	0	3	MSM 324	Theory of Ordinary Differential Equations	3	0	0	3
MSM 315	Mathematical Statistics	3	0	3	4	MSM 325	Probability Theory and Stochastic Processes	3	0	0	2-3
						MAT ####	Dept. Elective	3	0	9	3
Total		15	0	3	16	Total		18	0	9	18
Cumulative Credits at the End of First Year: 34 (Summer Internship in industry/R&D organization)											

Semester - III						Semester - IV					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSM 411	Measure Theory	3	0	0	3	MSM 421	Functional Analysis	3	0	0	3
MSM 413	Analysis on Manifolds	3	0	0	3	MSM 423	Differential Geometry	3	0	0	3
MSM 414	Partial Differential Equations	3	0	0	3	MAT ####	Dept. Elective/OE	3	0	0	3
MSM 415	Programming and Data Structures	3	0	3	4	MSC 429	Project	0	0	0	12
MAT ####	Dept. Elective	2	0	0	2	MSC 428	Project Phase - II	0	0	0	9
MSM 428	Project Phase – I	0	0	0	3						
Total		14	0	3	8	Total		9	0	0	18
Cumulative Credits at the End of Second Year: 66/71											

Partial list of electives

Course Code	Course Title
MAT ####	Algebraic Topology
MAT ####	Scientific Computing
MAT ####	Representation Theory of Finite Groups
MAT ####	Mathematical Modelling
MAT ####	Algebraic Number Theory
MAT ####	Topics in Number Theory
MAT ####	Homological Algebra
MAT ####	Commutative Algebra
MAT ####	Fourier Analysis
MAT ####	Advanced Probability Theory
MAT ####	Topics in Analysis
MAT ####	Sobolev Spaces and Elliptic Boundary Value Problems
MAT ####	Topics in Algebra
MAT ####	Numerical Solution of Differential Equations
MAT ####	Variational Methods and Control Theory
MAT ####	High Performance Computing
MAT ####	Finite Element Methods
MAT ####	Computational Fluid Dynamics
MAT ####	Machine Learning I
MAT ####	Artificial Intelligence
MAT ####	Big Data Analytics
MAT ####	Topics in Analysis II

Master of Science in Physical Sciences

Structure of the programme

Semester 1	Semester 2	Semester 3	Semester 4
MSP 311 (3003) Mathematical Methods in Physics	MSP 321 (3003) Statistical Mechanics	MSP 411 (3003) Nuclear Particle Physics OR MSP 412 (3003) Condensed Matter Physics II	(3003) MSP/OE Elective
MSP 312 (3003) Classical Mechanics	MSP 322 (3003) Condensed Matter Physics I	MSP 413 (3003) Quantum Mechanics- II	(3003) MSP/OE Elective
MSP 313 (3003) Electronics	MSP 323 (3003) Electrodynamics and STR	(3003) MSP/OE Elective	MSP 429: Project (12 Credits OR MSP 428: Project (9 Credits) / (3003) MSP/OE Elective
MSP 314 (3003) Quantum Mechanics I	(3003) MSP/OE Elective	(3003) MSP/OE Elective OR MSP 418: Project (3 Credits)	
MSP 315 (0093) Adv. Physics Lab I	MSP 325 (0093) Adv. Physics Lab II	MSP 415 (0093) Adv. Physics Lab III	
MSP 316 Seminar (0001)	MSP 326 Seminar (0001)	MSP 416 Viva-Voce (0001)	
16	16	16	18

Credit Distribution

Semester - I						Semester - II					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSP 311	Mathematical Methods in Physics	3	0	0	3	MSP 321	Statistical Mechanics	3	0	0	3
MSP 312	Classical Mechanics	3	0	0	3	MSP 322	Condensed Matter Physics I	3	0	0	3
MSP 313	Electronics	3	0	0	3	MSP 323	Electrodynamics and STR	3	0	0	3
MSP 314	Quantum Mechanics I	3	0	0	3	PHY ####	MSP/OE Elective	3	0	0	3
MSP 315	Adv. Physics Lab I	0	0	9	3	MSP 325	Adv. Physics Lab II	0	0	9	3
MSP 316	Seminar	0	0	0	1	MSP 326	Seminar	0	0	0	1
Total		12	0	9	16	Total		12	0	9	16

Cumulative Credits at the End of First Year: 32 (Summer Internship in industry/R&D organization)

Semester - III						Semester - IV					
Course	Course Name	L	T	P	C	Course	Course Name	L	T	P	C
MSP 411	Nuclear Particle Physics	3	0	0	3	PHY ####	MSP/OE Elective	3	0	0	3
MSP 412	Condensed Matter Physics II	3	0	0	3	PHY ####	MSP/OE Elective	3	0	0	3
MSP 413	Quantum Mechanics- II	3	0	0	3	PHY ####	MSP/OE Elective	3	0	0	3
MSP 415	Adv. Physics Lab III	0	0	9	3	MSP 429	Project	0	0	0	12
MSP 416	Viva-Voce	0	0	0	1						
PHY ####	MSP/OE Elective	3	0	0	3	MSP 428	Project Phase - II	0	0	0	9
MSP 428	Project Phase – I	0	0	0	3						
Total		9/12	0	9	16	Total		6/9	0	0	18
Cumulative Credits at the End of Second Year: 66/71											

Partial list of electives

Varsha semester		**Vasanth Semester**	
Experimental Methods (3003)	PHY4110	Principles of Digital imaging (3003)	PHY5201
Material & Device Characterization Techniques (SoP Open Elective) (2013)	PHY4111	Organic Semiconductors: Fundamentals and Applications (3003)	PHY5202
Semiconductor Physics and Technology (3003)	PHY4120	Sensor Technology	PHY5203
Digital Image Processing (3003)	PHY5101	Nonlinear Optics and Photonics (3003)	PHY4204
Lasers and Fibre Optic Communications (3003)	PHY5121	Electronic Devices and Computer Interfacing (2103)	PHY4205
Physics at Low Temperatures (3003)	PHY5122	Astrophysics (3003)	PHY4206
Nanoscale Physics (3003)	PHY5123	Numerical Simulation Techniques in Physics (3003)	PHY5207
Superconductivity(3003)	PHY5124	Introduction to Cosmology (3003)	PHY5208
Foundations of Quantum Mechanics (3003)	PHY5125	Particle Physics (3003)	PHY5209
Advanced Statistical Physics (3003)	PHY5126	Materials Growth and Processing Techniques [2013] (SoP Open Elective)	PHY4211
Fluid Dynamics (3003)	PHY5127	Theory of open quantum systems (3003)	PHY5212
General Relativity and Cosmology (3003)	PHY5128	Quantum Field Theory I (3003)	PHY5213

Quantum Many-body Theory (3003)	PHY5129	Probes in Condensed Matter Physics (3003)	PHY5214
Fluid Mechanics & Transport Phenomena (3003)	PHY4130	Quantum Transport (3003)	PHY5215
Modelling Materials (3003)	PHY4140	Advanced Mathematical Methods in Physics (3003)	PHY5216
Nuclear Particle Physics (3003)	PHY4119	Quantum Information Theory (3003)	PHY4217
Condensed Matter Physics II (3003)	PHY4129	Nonlinear Dynamics (3003)	PHY4218
		Atomic and Molecular Physics (3003)	PHY4220