

Course Curriculum for B.S. (Research)

A structured curriculum with a minimum of 40 credits for B.S. (Res.) program that combines core courses, electives, laboratory work, and project.

28 Credits including Core Courses, Electives, Development Course (SDC)/Lab Courses/Seminar	12 Credits for a Research Project
TOTAL = 40 credits	

I. The Course Curriculum for students opting for a degree in Chemistry

The Int. B.S. (Res.)–Ph.D. program in Chemistry is offered by the New Chemistry Unit.

Table 1

Semester 1	Courses	Credits
August-December	Core Course-I	4
	Core Course- II	4
	Elective 1	4
	Elective 2	4
	SDC (JCP 214)	4
Semester 2	Courses	Credits
January-May	Core Course- III	4
	Elective 3	4
Project runs through Semester 1 and 2. (JCD 213)		12
Total Credits		40
Pl. select Core and Elective Courses from Table 2.		

Table 2

Core Courses		Credits	Semester	Course Instructor
JCL 316	Solid State Chemistry	4	August - December	Prof. Senguttuvan Premkumar
JCL 223	Basic Mathematics	4	August - December	Dr. Abhishek Kumar

JTL 205	Principles and Applications of Quantum Mechanics	4	August - December	Prof. Swapan K Pati, & Dr. Abhishek Kumar
JML 310	Bonding, Structure, Symmetry and Physical Properties	4	August - December	Prof. A. Sundaresan & Prof. Tapas K. Maji
JCL 311	Molecular Structure and Spectroscopy	4	August - December	Prof. Kanishka Biswas
JFL 211	Basic Computational Science	4	August - December	Dr. Diwakar S. Venkatesan
JCL 304	Bioorganic and Medicinal Chemistry	4	August - December	Prof. Jayanta Haldar
JCL 312	Chemical Biology	4	August - December	Prof. T. Govindaraju
JCL 301	Reaction Mechanisms	4	January - May	Prof. Sridhar Rajaram
JCL 305	Organic Spectroscopy	4	January - May	Prof. Bani Kanta Sarma
JCL 307	Quantum Chemistry and Chemical Bonding	4	January - May	Prof. Ranjani Viswanatha
JML 306	Advanced Inorganic Chemistry	4	January - May	Prof. Tapas Kumar Maji
JTL 312	Introduction to Machine Learning	4	January - May	Guest faculty
JTL 208	Computational Method for Condensed Matter and Materials Science	4	January - May	Prof. Umesh V. Waghmare
Electives Can be also selected from the list of core courses above		Credits	Semester	Course Instructor
JCL 314	Biophysical Chemistry	4	August - December	Prof. K. N. Ganesh
JCL 206	Energy and Environment	4	August - December	Prof. Kanishka Biswas, Prof. Premkumar Senguttuvan Prof. Tapas Kumar Maji and Prof. Eswaramoorthy M

JML 237	Advanced Experimental Methods in Materials Science	4	August - December	Prof. Bivas Saha
JCL 315	Recent Trends in Inorganic and Nanomaterials	4	August - December	Dr. Pratap Vishnoi
JML 232	Micro and Nano Fabrication Methodology	4	January - May	Prof. G.U. Kulkarni
JML 201	Electronics and devices	4	January - May	Prof. K.S. Narayan
JCL 302	Polymer and Supramolecular Chemistry	4	January - May	Prof. Subi Jacob George
JCL 310	Structure and Chemical Crystallography	4	January - May	Prof. Sebastian C Peter

II. Course Curriculum for students opting Materials Science

The Int. BS (Res.)–Ph.D. Program in Materials Science will be jointly offered by Chemistry and Physics of Materials Unit (CPMU), Theoretical Sciences Unit (TSU) New Chemistry Unit (NCU) and International Centre for Materials Science (ICMS).

Out of 12 courses mentioned in the first part of the table 3 (Semester 1 & II), 5 courses are mandatory as core courses and one elective course can be credited from the table exclusive of core courses. Elective courses can also be credited from courses offered by other units if it is suitable. SDC is mandatory.

Table 3

Semester 1	Course Code	Course Title	Credits	Course Instructor
Aug-Dec	JTL 205	Principles & Applications of Quantum Mechanics	4	Prof. Swapan K Pati,
	JTL 207	Mathematical Methods in Physics	4	Prof. Kavita Jain
	JCL 316	Solid State Chemistry	4	Prof. Premkumar Senguttuvan
	JML 237	Advanced Experimental Methods in Materials Science	4	Prof. Bivas Saha

JML 310	Bonding, Structure, Symmetry, and Physical Properties	4	Prof. A. Sundaresan & Prof. Tapas K. Maji
JCL 206	Energy and Environment	4	Prof. Kanishka Biswas Prof. Premkumar Senguttuvan Prof. Tapas Kumar Maji Prof. M. Eswaramoorthy
JCL 207	Physical Chemistry	3	Prof. S. Balasubramanian
JMP 236/ JTP 219/JCP 214	SDC	4	CPMU/TSU/NCU
Electives			
JML 308	Fundamentals of computational Statistical Mechanics	4	Prof. S. Balasubramanian
JML 213	Inorganic Chemistry	4	Prof. M. Eswaramoorthy
JTL 217	Topics in Classical Mechanics/ Molecular Dynamics	4	Prof. Srikanth Sastry
JCL 202	Organic Chemistry	3	Prof. Sarit S. Agasti
JCL 311	Molecular Structure and Spectroscopy	4	Prof. Kanishka Biswas
JCL 304	Bioorganic and Medicinal Chemistry	4	Prof. Jayanta Halder
JCL 315	Recent Trends in Inorganic and Nanomaterials	4	Dr. Pratap Vishnoi

Semester 2	Course Code	Course Title	Credits	Course Instructor
Jan-May	JTL 201	Advanced Condensed Matter Physics	4	Dr. Medha Dandu/ Prof. Shobhana Narasimhan
	JML 210	Group Theory and Vibrational Spectroscopy	4	Prof. Chandrabhas Narayana
	JTL 208	Computational Method for Condensed Matter and Materials Science	4	Prof. Umesh V. Waghmare
	JML 201	Electronics & Devices	4	Prof. K.S. Narayan
	JML 229	Fundamentals of Optics	4	Dr. Abhishek Kumar/ Prof.

				Ranjan Datta/ Prof. Bivas Saha
	If Project in TSU Lab- JTD 220 If Project in CPMU Lab- JMD 235 If Project is in NCU – JCD 213	Project	12	
Electives				
JTL 204	Statistical Thermodynamics		4	Prof. Subir K Das
JML 302	Transmission Electron Microscopy and Spectroscopy		4	Prof. Ranjan Datta
JML 232	Micro and Nano Fabrication Methodologies		4	Prof. G.U. Kulkarni
JTL 311	Advanced Solid-State Physics		4	Prof. N.S. Vidyadhiraja
JML 215	Principles of Electricity and Magnetism		4	Prof. Rajesh Ganapathy
JCL 302	Polymer and Supramolecular Chemistry		4	Prof. Subi Jacob George
JML 306	Advanced Inorganic Chemistry		4	Prof. Tapas Kumar Maji
JCL 310	Structure and Chemical Crystallography		4	Prof. Sebastian C Peter
JCL 301	Reaction Mechanisms		4	Prof. Sridhar Rajaram
JCL 305	Organic Spectroscopy		4	Prof. Bani Kanta Sarma
JCL 307	Quantum Chemistry and Chemical Bonding		4	Prof. Ranjani Viswanatha

III. Course Curriculum for students opting Physical Sciences

The Int. B.S. (Res.) Program in Physics will be offered jointly by CPMU and TSU.

Out of 10 courses mentioned in the first part of the Table 4, five core courses are mandatory and one elective course can be credited from the table exclusive of core courses. Elective courses can also be credited from courses offered by other units if it is suitable. SDC is mandatory.

Table 4

Semester 1	Course Code	Course Title	Credits	Course Instructor
------------	-------------	--------------	---------	-------------------

Aug-Dec	JTL 205	Principles & Applications of Quantum Mechanics	4	Prof. Swapan K Pati	
	JTL 207	Mathematical Methods in Physics	4	Prof. Kavita Jain	
	JML 237	Advanced Experimental Methods in Materials Science	4	Prof. Bivas Saha	
	JTL 217	Topics in Classical Mechanics/ Molecular Dynamics	4	Prof. Srikanth Sastry	
	JML 310	Bonding, Structure, Symmetry and Physical Properties	4	Prof. A. Sundaresan & Prof. Tapas K. Maji	
	If CPMU Lab - JMP-236 If TSU Lab - JTP - 219	SDC	4	CPMU/TSU Lab	
	Electives				
	JML 308	Fundamentals of computational Statistical Mechanics	4	Prof. S. Balasubramanian	
	JFL 211	Basic Computational Sciences	4	Dr. S. Diwakar Venkatesan	
	JFL 220	Mathematics to Machine Learning	4		
Semester 2	Course Code	Course Title	Credits	Course Instructor	
Jan-May	JTL 204	Statistical Thermodynamics	4	Prof. Subir K Das	
	JTL 201	Advanced Condensed Matter Physics	4	Dr. Medha Dandu/ Prof. Shobhana Narasimhan	
	JML 215	Principles of Electricity and Magnetism	4	Prof. Rajesh Ganapathy	
	JML 229	Fundamentals of Optics	4	Dr. Abhishek Kumar/ Prof. Ranjan Datta/ Prof. Bivas Saha	
	JML 201	Electronics & Devices	4	Prof. K.S. Narayan	
	If Project in TSU Lab- JTD 220 If Project in CPMU Lab- JMD 235	Project	12	CPMU/TSU Faculty	
	Electives				
JML 302	Transmission Electron Microscopy and Spectroscopy	4	Prof. Ranjan Datta		

	JML 232	Micro and Nano Fabrication Methodologies	4	Prof. G.U. Kulkarni
	JML 210	Group Theory and Vibrational Spectroscopy	4	Prof. Chandrabhas Narayana
	JTL 208	Computational Method for Condensed Matter and Materials Science	4	Prof. Umesh V. Waghmare
	JTL 311	Advanced Solid-State Physics	4	Prof. N.S. Vidhyadhiraja

IV. Course Curriculum for students opting Biology

A. Molecular Biology and Genetics Stream

The Int. B.S. (Res.) Program in Biology in Molecular Biology and Genetics stream will be offered by the MBGU.

Table 5

Semester 1	Course Code (any 3 + JBP216)	Course Title	Credits	Course Instructor	
Aug-Dec	JBL 219	Fundamentals of Gene Regulation	4	Dr. Kushagra Bansal	
	JBL 204	Basics in Immunology	4	Prof. Ranga Uday Kumar	
	JBL 305	RNA Biology	4	Dr. Varun Bhaskar	
	JBL 302	Human Disease Genetics	4	Prof. Anuranjan Anand	
	JBL 206	Stem Cells and Development	3	Prof. Maneesha S Inamdar	
	JBP 216 core	Laboratory - I	4	Dr. Christiana Immanuel	
	Electives				
	JNL 208	Experimental Design and Quantitative Tools for Biologists	4	*BS Res PhD Coordinator MBGU-NSU	
	JNL 202	Introduction to Neurobiology - Part I	4	Prof. Sheeba Vasu	
JNL 201	Introduction to Neuroanatomy	4	Dr. Achira Roy		
JNL 301	Advanced Neurogenetics	3	Prof. Sheeba Vasu		

Semester 2	Course Code (any 1 + JBP221)	Course Title	Credits		
Jan-May	JBL 203	Gene Expression and Disease	4	Prof. Tapas Kumar Kundu	
	JBL 202	Basic Biological Chemistry	4	Prof. Hemalatha Balaram	
	JBL 304	Principles of Virology	4	Dr. Shwetha Shivaprasad	
	JBL 303	Intracellular Traffic, Transport and Turnover	4	Prof. Ravi Manjithaya	
	JBP 221	SBS _BS Project	12	MBGU Faculty	
	Electives				
	JBL 220	Mechanobiology	3	Dr. Varun Bhaskar	
	JNL 203	Introduction to Neurobiology - Part II	4	Dr. Anupama Sathyamurthy	
	JNL 204	Introduction to Chronobiology	4	Prof. Sheeba Vasu	

B. Neuroscience Stream

The Int. B.S. (Res.)- Ph.D. Program in Biology in the Neuroscience stream will be offered by the NSU.

Table 6

Semester1	Course Code	Course Title	Credits	Course Instructor	
Aug-Dec	JNL 202	Introduction to Neurobiology - Part I	4	Dr. Achira Roy	
	JNL 201	Introduction to Neuroanatomy	4	Prof. Sheeba Vasu	
	JNL 208	Experimental Design and Quantitative Tools for Biologists	4	*BS Res PhD Coordinator MBGU-NSU	
	JBP 216	Laboratory - I	4	Dr. Christiana Immanuel	
	Electives				
	JBL 302	Human Disease Genetics	4	Prof. Anuranjan Anand	
	JBL 219	Fundamentals of Gene Regulation	4	Dr. Kushagra Bansal	

	JNL 301	Advanced Neurogenetics	3	Prof. Sheeba Vasu
	JBL 204	Basics in Immunology	4	Prof. Ranga Uday Kumar
	JBL 305	RNA Biology	4	Dr. Varun Bhaskar
	JBL 206	Stem Cells and Development	3	Prof. Maneesha S Inamdar
Semester 2	Course Code	Course Title	Credits	Course Instructor
Jan-May	JNL 203	Introduction to Neurobiology - Part II	4	Dr. Anupama Sathyamurthy
	JBL 303	Intracellular Traffic, Transport and Turnover	4	Prof. Ravi Manjithaya
	JNP 221	SBS _BS Project	12	NSU Faculty
	Electives			
	JBL 203	Gene Expression and Disease	4	Prof. Tapas Kumar Kundu
	JBL 220	Basic Biological Chemistry	4	Prof. Hemalatha Balaram
	JNL 204	Introduction to Chronobiology	4	Prof. Sheeba Vasu
	JBL 202	Mechanobiology	3	Dr. Varun Bhaskar
	JBL 304	Principles of Virology	4	Dr. Shwetha Shivaprasad

C. Evolutionary and Organismal Biology stream

The Int. B.S. (Res.)- Ph.D. Program in Biology in the Evolutionary and Organismal Biology stream will be offered by the EOBU.

Table 7

Semester 1	Course Code	Course Title	Credits	Course Instructor
August-December	JEL 213	Introduction to Statistical Hypothesis Testing	4	Prof. Amitabh Joshi
	JEL 206	Animal Behaviour	4	Prof. TNC Vidya
	JEL 214	Functional and Comparative Zoology	4	Dr. Anand Krishnan
	JEL 201	Population and Quantitative Genetics	4	Prof. Amitabh Joshi

	JEL 212	Introduction to the Evolution and Diversity of Life-Forms	4	Guest Instructor/New Faculty
	JED 217	Project	2	EOBU Faculty
Semester 2	Course Code	Course Title	Credits	
January-May	JEL 216	Basic Ecology	4	Guest Instructor/New Faculty
	JEL 215	Molecular Evolution, Phylogenetics, And Phylogeography	4	Prof. TNC Vidya
	JED 217	Project	10	EOBU Faculty

V. Course Curriculum for students opting Mechanics and Computing

The Int. B.S. (Res.)- Ph.D. Program in Mechanics and Computing will be offered by the EMU.

Table 8

Semester 1	Course Code	Course Title	Credits	Course Instructor
August-December	JFL 201	Applied Mathematics	4	Prof. Meheboob Alam
	JFL 220	Mathematics for Machine Learning	4	Prof. Meheboob Alam
	JFL 217	Solid Mechanics	4	Dr. Animesh Pandey
	JFL 215	Dynamical Systems and Chaos	4	Prof. Janaki Balakrishnan
	JFL 211	Basic Computational Sciences	4	Dr. Diwakar S. Venkatesan
	JFQ 222	Seminar/SDC	4	

Any 4 courses & Seminar

Semester 2	Course Code	Course Title	Credits	Course Instructor
January-May	JFL 221	Introductory Fluid Mechanics	4	Guest Instructor
	JFL 218	Differential Geometry with Applications to Mechanics	4	Dr. Animesh Pandey
	JFL 219	Introduction to Neural Computing	4	Prof. Santosh Ansumali
	JTL 204	Statistical Thermodynamics	4	Prof. Subir Das
	JFD 223	Project	12	

Any 2 courses +12 (project)

The course curriculum and credits are subject to changes