VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY
NAGPUR – 440 010

M.Sc. PROGRAMME 2014-16

Information Brochure

Admission to M.Sc.(Physics), M.Sc. (Chemistry) and M.Sc.(Mathematics)

Written Entrance Test for admission on (For Non-JAM qualified candidates)
: 25th May 2014 :

Direct admission to JAM qualified candidates as per inter-se-merit

Admission Policy and Procedure – 2014

1.0 General : About the Institute:

Visvesvaraya National Institute of Technology(VNIT), Nagpur is one of the thirty National Institutes of Technology in the country. National Institutes of Technology Act, 2007 (29 of 2007)) declared VNIT Nagpur as an Institute of National Importance along with all other NITs. The Act was brought into force from 15th August 2007. Earlier, the Institute was known as Visvesvaraya Regional College of Engineering (VRCE). It was established in the year 1960 under the scheme sponsored by Govt. of India and Govt. of Maharashtra. The Institute is named after the eminent engineer, planner and statesman of the country Bharat Ratna 'Sir M. Visvesvaraya'.

Institute offers B. Tech. degree in eight disciplines and M. Tech. degree in seventeen disciplines of Engineering. It also has B. Arch. and M. Arch programmes in Architecture. Admissions to UG and PG programmes are on the basis of JEE (Main) and GATE scores respectively. UG and PG programmes are credit based and a number of electives are offered to the students. About 3000 UG and 300 PG students are pursuing studies for the degrees. Institute offers Ph. D programs in various streams of Engineering, Science, Humanities and Architecture. Institute has highly qualified faculty strength of more than 185. Good testing, computing and consultancy facilities are also available. Institute has good Training & Placement Section and more than 90% students get the placement through campus interviews. Institute has collaboration with NEERI, JNARDDC, IIT Kanpur, IIT Mumbai, BRNS etc. for research and other academic activities. VNIT has excellent residential facilities to cater the need of more than three thousand students. There are ten boys Hostels and three girls Hostels.

2.0 About the Course:

Two year full time M.Sc. programme in Physics, Chemistry and Mathematics

Science is basic foundation of any technological and engineering creation. In view of the changing scenario at national and international level in field of Science and Technology, there is great demand for basic sciences with considerable knowledge of its applications. VNIT is committed to high academic standards. The M.Sc. courses are designed for four semesters (two years) in such a way that a good basic foundation of subjects is laid and applications along with recent developments are covered. Relative grading will be followed and credits will be allotted based on

academic performance. Students will also get theoretical and practical knowledge of computer programming. These M.Sc. programmes provide opportunity to make career in R&D, industries and academic institutions. Opportunity for the placement may be provided by the Institute.

I) M.Sc.(Physics) Programme:

M.Sc. (Physics) programme imparts hands on training in theoretical as well as practical aspects of physics, so that student's ability to tackle physics problems is inculcated in them. This programme lays thrust on fundamentals of core and applied subjects of Physics and also provides knowledge on topics of current interest.

In the M.Sc. programme, total 15 theory courses will be taught over four semesters. There will be a seminar and a project. The department has well equipped labs to provide practical skills to students.

Classical, Quantum and Statistical Mechanics and Solid State Physics lay a basic foundation in core subjects of Physics. Courses such as Electronics, Characterization techniques, Materials Science, Thin film techniques and Nanomaterials provide knowledge of applied topics and cover topics of recent interest also. Computer programming will also be taught. Students can look forward to a career in teaching, industry and research. To aid in teaching career, NET syllabus is covered. Electronics and various materials courses of this programme will be of great help for shaping a career in research and industry.

I I) M.Sc.(Chemistry) Programme:

The special feature of M.Sc. (Chemistry) is a good foundation of basics and research component through practical skills, which in turn will provide excellent job prospects in Academics, Industries and other field of interest. M.Sc. (Chemistry) will provide competence to tackle frontier area in Green chemistry, Supramolecular chemistry, Sensors, Advanced materials and Advanced organic chemistry.

Two years M.Sc programme in Chemistry will be conducted in four semesters. Communication Skill has been proposed as an audit course in first semester, which will help students develop better expression. In addition to theory and practical courses project phase – I and computational chemistry lab will be introduced in third semester. Fourth semester has two electives courses, basics of electronics and project phase-II. Nine electives have been incorporated in the course considering variety of advanced interest.

III) M.Sc.(Mathematics) Programme:

The objective of the M. Sc. (Mathematics) is to develop highly qualified/trained mathematicians to cater to the needs of the industry, teaching and research institutions. Department of Mathematics has highly qualified, motivated, dynamic and experienced faculty members. The M.Sc.(Mathematics) programme intended to offer a balanced combination of core and applied courses of Mathematics. It also emphasizes advanced developments in the field of analysis, fluid mechanics, mathematical physics and scientific computing. This M.Sc. programme is designed for four semesters. In the first semester a course of Introduction to Computer Programming and another course of communication skill are included which will be helpful to students in their

professional career. In addition to the regular courses, three electives courses in third and fourth semesters are available for the students. There is provision for each student to give a seminar in 3rd semester and complete a dissertation in fourth semester under the guidance of highly qualified faculty members. In these activities, student explores a specific topic, surveys the available literature and submits a critical review in the form of a report which may also include original theoretical results and/or results of experimental work. This process provides an initiation into mathematical research and also equips the student with the skills of presentation of research/technical report. This will be useful in developing awareness, aspiration and innovative ability to solve new scientific problems.

3.0 Eligibility:

For applying for the M.Sc. Courses, a candidate should satisfy the following criterion:

B.Sc/Bachelors degree with minimum 55**%** marks aggregate or equivalent grade (50% in case of candidates from reserved category) with Physics/Chemistry/Mathematics as one of the main subject to be eligible for the respective course.

Requirement for admission:

Course	**Eligibility Requirement**
M.Sc.(Physics)	Candidate should have **Physics** at B.Sc./Bachelor degree Level in all the three years along with Mathematics as one of the subjects
M.Sc. (Chemistry)	Candidate should have **Chemistry** at B.Sc./Bachelor degree Level in all the three years and any other combination
M.Sc.(Mathematics)	Candidate should have **Mathematics** at B.Sc. /Bachelor degree Level in all the three years and any other combination

Candidates appearing in the final year of B.Sc. degree may also apply. He/She is required to submit the proof of appearing in the exam like Admit Card/Hall ticket.

Apart from this, the candidates should also clear a **written entrance test** successfully for the admission. The written test will be conducted by VNIT and consists of objective type questions.

For JAM (Joint Admission Test for M.Sc. conducted by IITs) qualified candidates with valid score and above cut-off, this written entrance test is NOT necessary. They can directly apply for admission. JAM qualified candidates will be given the preference as per inter-se-merit, in the admission to the M.Sc. Programmes.

4.0 Seat Matrix : Availability of seats

Course /Category	GEN	OBC	SC	ST	PWD*	Total
M.Sc.(Physics)	9	05	03	02	01	20
M.Sc. (Chemistry)	9	05	03	02	01	20
M.Sc.(Mathematics)	10	06	03	01		20
Total						**60**

GEN- General , OBC-Other Backward Classes, SC-Scheduled Caste, ST-Scheduled Tribe,
PWD- Persons With Disabilities,
Reservation as per Government of India Rules.
* PWD seats will be merged to GEN seats if the candidates are not available.

4.1 Category Rules

- **If a candidate is not able to produce required category certificate (OBC/SC/ST/PWD) or the certificate is found invalid, his/her category will be changed to General category.**

- For Maharashtra candidates, caste validity certificate is essential to claim the category benefits.

- For **OBC** candidates latest non-creamy layer certification is mandatory without which they will not be considered for OBC category and treated as General category candidate.

- For candidates coming under Persons with Disabilities **(PWD)** category, a minimum of 40% disability is required subject to the condition that the candidate is capable of carrying out activities related to theory and practical work as applicable to course. They are required to submit Physical disability certificate signed by three members of Medical Authority duly constituted by the State or Central Government under Persons with Disability Act. One of the doctors in the Medical Authority shall be a specialist in the particular field pertaining to the disability. The name, degree, and specialization of all the doctors, date of issue shall be clearly visible in the certificate.

5.0 Admission Schedule:

Tentative Admission Schedule: Important dates

SN	Events	Dates	Action by Candidates
1.	Submission of hard copy of the Application Forms for written test/ **JAM** candidates	**28th April to 16th May, 2014**	Application Form will be available on the website www.vnit.ac.in , Download then fill and submit to VNIT
2.	Last date of submission of hard copy of the Application Form	**16th May 2014 till 5:00 p.m.**	Application forms received late will not be considered.
3.	Display of eligible candidates list for written entrance examination on institute website www.vnit.ac.in and Notice Board	**21st May 2014 at 11:00 am**	See Institute website or Notice Board for list
4.	Written Entrance Test (Venue: Department of Mathematics at VNIT Nagpur)	**25th May 2014 (Sunday)** **Physics : 9:00 to 10:00 am** **Chemistry : 11:00 am to 12:00 noon** **Mathematics : 2:00 pm to 3:00 pm**	Reach 30 minutes before the written entrance test to the venue as per selected test
5.	Display of merit list on institute website www.vnit.ac.in and Notice Board. **Written entrance test and JAM merit list**	**30th May 2014**	See Institute website or Notice Board for list
6.	Admission process (Round I) (Venue: Department of Mathematics, VNIT, Nagpur)	**7th July 2014** **(Personal Reporting: 9:00 am to 10:00 am)**	Report sharply at the venue with all original documents and DD for fees
7.	Admission process (Round II) for unfilled seats/ vacancies against cancellation if any (Venue: Department of Mathematics, VNIT, Nagpur)	**17th July 2014** **(Personal Reporting: 9:00 am to 10:00 am)**	Report sharply at the venue with all original documents and DD for fees
8.	Admission to wait listed candidates against vacancies	**25th July 2014**	See Institute website or Notice Board for list
9.	Start of Semester	**28th July 2014**	Start attending the classes (for admitted students)

Institute reserves the right to conduct further admission rounds or drop the rounds, as per the situation. These additional rounds, if conducted, will be subject to appropriate rules, to be announced later.

6.0 Admission Procedure :

6.1 Admission Form for JAM qualified candidates:

- Application Form for the Admission and Information Brochure may be downloaded from the website: www.vnit.ac.in.
- Submit separate application form for **M.Sc.(Physics), M.Sc. (Chemistry) and M.Sc.(Mathematics) based on JAM score for respective subjects.**
- Demand Draft(DD) of **Rs 300 (for General and OBC)/Rs. 150 (for SC/ST)** in favour of "Director, VNIT, Nagpur" payable at Nagpur along with each application form.
- Documents required with application form:

  i. Attested photocopy of High School (X Std.) Certificate for date of birth
  ii. Attested photocopy of SC/ST/OBC/OM/PWD certificate, if applicable
  iii. Attested photocopies of mark/grade sheets of Intermediate and B.Sc.
  iv. Proof of appearing B.Sc. final examination, if applicable
  v. Attested photocopy of **JAM score card**.

- Duly filled Application Form, DD and documents should reach to the address given for communication in 6.3 between **28th April to 16th May, 2014** (Last date 16th May 2014 till 5.00 pm).

6.2 Written Entrance Test (JAM qualified candidates need not to appear in the test)

JAM qualified candidates with their valid score will be considered for the admission to M.Sc. programme based on inter-se-merit.

The written entrance examinations for admission to various courses are aimed at assessing the candidate's understanding of the concepts in the principles of subjects of study. **Merely passing of entrance test does not guarantee the admission to the M.Sc. courses, unless candidate satisfies other eligibility criterion.**

6.2.1 Application procedure for written entrance test:

- Application Form for the written entrance test and Information Brochure may be downloaded from the website: www.vnit.ac.in.
- Separate written entrance test will be conducted for **M.Sc.(Physics), M.Sc. (Chemistry) and M.Sc.(Mathematics).**
- Fill the Application Form as per the M.Sc. programme of your interest. Separate application for each M.Sc. programme (Physics/Chemistry/Mathematics) is required for appearing in written examination of that course with DD and documents.

- Demand Draft (DD) of **Rs 300 (for General and OBC)/Rs. 150 (for SC/ST)** in favour of "Director, VNIT, Nagpur" payable at Nagpur along with each application.

- Documents required with application form:

  i. Attested photocopy of High School (X Std.) Certificate for date of birth
  ii. Attested photocopy of SC/ST/OBC/Minority/ PWD certificate, if applicable
  iii. Attested photocopies of mark/grade sheets of Intermediate and B.Sc.
  iv. Proof of appearing B.Sc. final examination, if applicable
  v. Attested photocopy of JAM score card, if applicable.

Duly filled Application Form with DD and documents should reach to the address given for communication in 6.3 between **28th April to 16th May, 2014** (Last date 16th May 2014 till 5.00 pm).

6.2.3 Salient features of Written Entrance Test:

- There will be separate entrance test for M.Sc. (Physics), M.Sc. (Chemistry) and M.Sc. (Mathematics).
- Student can appear in more than one entrance test provided he/she has sent the application forms for the appropriate programs and he/she fulfills the eligibility criteria. Separate application form will have to be submitted along with the necessary documents and DD for each entrance test to M.Sc. (Physics), M.Sc. (Chemistry) and M.Sc. (Mathematics).
- If student has applied in more than one program, he/ she will get different roll no. for each test.
- The syllabus for entrance test is also different for the three M.Sc. programs.
- The entrance test will be of objective type and of one hour duration.

Date: The entrance tests will be conducted on **25th May 2014 (SUNDAY)**
Duration: One Hour

The schedule for the tests is:

Entrance test for M.Sc. (Physics)	: 9:00 am to 10:00 am
Entrance test for M.Sc. (Chemistry)	: 11:00 am to 12:00 noon
Entrance test for M.Sc. (Mathematics)	: 2:00 pm to 3:00 pm

Students are required to report at least 30 minutes before the commencement of the test. Late reported candidates will not be permitted to appear in the examination.

Venue for written entrance test: <u>Dept of Mathematics, VNIT, Nagpur.</u>

No Travelling expenses will be provided for appearing in the written entrance test. Students have to make their own arrangement for travel, food etc.

Syllabus for written entrance test:

Separate syllabus for written entrance test

M.Sc. (Physics), M.Sc. (Chemistry), M.Sc. (Mathematics): **See Annexure -I**

6.3 Address for communication (for sending duly filled Application Form of written entrance test with DD and other documents/ also for JAM candidate):

Dr. P. Pramod Chakravarthy
Chairman, MSc-Admisions-2014
Department of Mathematics,
Visvesvaraya National Institute of Technology,
Nagpur 440 010.

Contact Numbers : 0712 - 2801404

Email : mscadm@vnit.ac.in

6.4 Merit List:
There will be different merit lists for each course for the purpose of admission.

a) JAM merit list: JAM merit list will be prepared based on score and the number of JAM qualified candidate's applications received by the institute for each course and displayed on the institute website and on the notice board.

b) Written entrance test merit list: Based on performance in the entrance test conducted by VNIT, separate merit list will be prepared for each course viz. M.Sc. (Physics), M.Sc. (Chemistry) and M.Sc. (Mathematics).

During the admission process, if there is a tie, candidate's with higher B.Sc. aggregate marks percentage will be given the preference and then respective subject aggregate marks percentage will be considered.

Display of Merit Lists: Programme wise merit list will be displayed on the Institute website and Notice Board in Department of Mathematics. There will not be any communication to the candidates. Candidates are advised to see as above.

7.0 Counselling for admission:

Admission to the M.Sc. courses is strictly on the basis of merit rank as per the **JAM/**written entrance test results in respective course. Viz. M.Sc.(Physics) merit list of JAM/written entrance test will be the considered for the admission of the candidate for M.Sc(Physics) course only and not for other course. Likewise other course wise merit list will be considered for that course only. Merit rank of each course will be separate. Each merit list will be operated separately for the purpose of that course. No change of candidature will be permitted for merit rank of one course to other.

JAM merit list will be operated first for the admission then the written entrance test merit list, subject to availability of seats.

Date of personal reporting for the admission

Round I : 7th July 2014
(Personal Reporting: 9:00 AM to 10:00 AM)

Round II : 17th July 2014
(Personal Reporting: 9:00 AM to 10:00 AM)

7.1 Steps in counseling for admission:

a) Report to the registration desk
b) Filling of admission forms
c) Documents verification
d) Payment of fees
e) Allotment of seat subject to availability as per merit & choice of the candidate
f) Submission of admission form and collection of provisional admission letter

7.2 Documents verification:

Following **ORIGINAL** documents will be verified during Counseling.

- Transfer certificate/Migration Certificate
- B.Sc. Mark sheets, Certificate
- Proof for date of birth (SSC/HSC certificate)
- JAM score card (for JAM qualified candidates only)
- Caste Certificate, Minority Certificate, non-creamy layer and PWD certificate (If Applicable)*

* A student claiming to belong to SC/ST/OBC/PWD should produce a certificate in the prescribed form signed by any of the following authorities

1. District Magistrate/Additional District Magistrate/Collector/Deputy Commissioner/ Additional Deputy Commissioner/Deputy Collector/I Class Stipendiary Magistrate/Sub Divisional Magistrate/Taluka Magistrate/Executive Magistrate/Extra Assistant Commissioner.
2. Chief Presidency Magistrate/Additional Chief Presidency Magistrate/ Presidency Magistrate.
3. Revenue Officer not below the rank of Tahsildar.
4. Sub-Divisional Officer of the area where the candidate and/or his family normally resides.

For Maharashtra candidates caste validation certificate is essential
For OBC candidates latest non-creamy layer certification is mandatory

If a candidate fails to produce any of the required documents while counseling, he/she will be given Provisional Admission subject to the fulfillment of other requirements and payment of the prescribed fee. Such candidate should produce the original document latest by **24th July, 2014** personally, failing which the provisional admission **will be treated as cancelled** without giving any notice.

Note: If the original certificates are not in Hindi / English, duly certified Hindi/English version /translation of such certificates will be required

7.3 Fee Structure:

Fees Structure for M.Sc. Programme : 2014-2015

a) **One Time Charges (at the admission year)**

Library deposit	2000
Identity card	200
Medical exam	100
Student medical aid fund	2000
Total	**4300**

b) Fees per year

SN	Head of Fees	Fees per year	Fees to be paid in 1st term (July)	Fees to be paid in 2nd term (Dec.)
1.	Tuition fees	15000	7500	7500
2.	Registration fees	500	500	
3.	Library Fees	750	750	
4.	Gym. Annual Day & Magazine Fees	800	800	
5.	Physical Education & Medical Fees	100	100	
6.	Internet & Computer Maintenance Fees	750	750	
7.	Training & Placement fees	400	400	
8.	Student Aid Fund	300	300	
9.	Industry Institute Interaction	300	300	
10.	Development Fees	2000	2000	
11.	End Semester Examination Fees (1st & 2nd Sem)	1000	500	500
	Total	**21900**	**13900**	**8000**

In addition to above, Convocation Fees of Rs 500/- to be paid at the Final year only.

Fees to be paid at the time of admission:

- **Rs 18200/- for General /OBC Category candidates**
- **Rs 11200/- for SC/ST* Category candidates (* Exemption in Tuition fees).**

Payment of fees to be made in the form of DD drawn in favour of "The Director, VNIT, Nagpur" payable at Nagpur. Cash / Cheques will not be accepted.

Hostel Accommodation and Rules:

Hostel accommodation is provided subject to availability and as per existing hostel rules. Candidates can visit Hostel Section of VNIT for further clarifications.
Hostel fees: Rs. 47400/- (for both Boys & Girls)

Payment to be made in the form of DD drawn in favour of "The Director, VNIT, Nagpur" payable at Nagpur. Cash/Cheque will not be accepted.

7.4 Communication:

All communications by the Institute for the Admission Process will be made only through the institute website **www.vnit.ac.in**. Candidates are advised to access the website on regular basis for admission updates. **No individual communication shall be entertained.**

For any other queries:

Contact Numbers : 0712 - 2801404

Email : mscadm@vnit.ac.in

7.5 Seat Allotment Process:

Process:

JAM merit list candidates will be called as per their rank to the registration desk.
Seat allotment will be done as per inter-se-merit after completion of other formalities like document verification and payment of fees.

After exhausting the JAM merit list, candidates of written entrance test merit list will be called to the registration desk. **Written entrance examination merit list will be operated for the admission, subject to availability of seats in the respective M.Sc. programme.**

Allotment of seat will be done for the courses as per the following sequence:

I) M.Sc. (Physics)
II) M.Sc. (Chemistry)
III) M.Sc. (Mathematics)

Candidate getting allotment of multiple seats is required to cancel earlier seat. Vacant seat will be offered to the next merit candidate.

If at any stage, the information provided by a candidate is found to be false, his/her admission candidature will be cancelled and he/she will be debarred from the admission process. **Suitable legal action will be initiated, if necessary.**

7.6 Waiting list

Waiting list of the candidates will be prepared at the end of Round II. During the counseling, if the seat is not available to the reporting candidate due to exhaustion of seats, then as per the candidate's desire, he/she will be included in the waiting list provided the candidate satisfies the eligibility and pays the requisite fees. Seat falling vacant subsequently due to cancellation, will be offered to the candidate as per merit and allotment list will be displayed as per schedule on institute website and on the institute notice board.

Such candidate has to submit the choice preference form during counseling for further processing and allotment against vacant seats. Candidates have to complete all other formalities of admission

like **document verification, payment of fees** etc. for inclusion of their names in the waiting list. They have to report for the final admission, if they get the seat against vacancy.

In case, waitlisted candidate does not get any seat due non-availability of seat against cancellation, then the full fees will be refunded after the due date.

7.7 Admission against Vacant Seats:

Seats falling vacant due to cancellation will be offered to the waitlisted candidates as per merit, category and their eligibility. Seat allotted in such cases will be displayed as per schedule on institute website and on the institute notice board. Students are advised to see the website or notice board on the scheduled date. No individual communication is made.

8.0 Closing of Admission:

In no circumstances admission will be given after **4th August 2014.**

9.0 Cancellation of Admission and Refund of fees:

1. If it is observed that a certain candidate has been wrongly admitted for whatever reason, the admission shall be cancelled forthwith. In such an event the fees shall be refunded.

2. Candidates who, at any stage, cancel their admission by own will not be considered for subsequent admission if any.

3. Once the allotment of seat is done, it will not be considered again for re-allotment for other available seat at the same instant for other course provided earlier allotment is cancelled.

10.0 Cancellation/withdrawal of admission will be as per the following provisions

1. If the candidate informs about his withdrawal/cancellation of admission in writing on or before **17th July, 2014**; the fees will be refunded after deduction of processing fee Rs 1000/-. For this, the candidate has to bring a DD of Rs. 1000/- in favour of "Director, VNIT, Nagpur" payable at Nagpur. After receiving the DD of Rs. 1000/-, the original DD of will be returned back to the candidate.

2. If the avenue to fill the seat is available, then only Rs. 1000/- will be deducted as processing fee.

3. In case the seat remains finally unfilled after the withdrawal of admission and after commencement of the Academic Term, then refund will be as per the following rules:
(a) If admission is cancelled within 30 days of joining the institute (i.e., 28th August 2014), the candidate shall forfeit the tuition fees. The candidate will get the refund of other fees (excluding the tuition fees).
(b) If admission is cancelled after 30 days of joining the institute (i.e., 28th August 2014), the candidate will not get any refund.

Note: A candidate is required to submit the original fee receipt and original admission letter along with the application for withdrawal of admission and seeking the refund.

11. 0 Provisions of admission

If any dispute arises by interpreting any of the above provisions, the decision of the Director, VNIT shall be final and binding on all candidates.

The above Rules are subject to modifications whenever found necessary by the Institute.

The Admission Policy & Procedures are subject to the jurisdiction of Hon'ble Court of Nagpur.

Director,
VNIT, Nagpur

Disclaimer: *Institute is not responsible for any inadvertent error that may have crept in the soft copy of the M.Sc. admission information published on the website and reserves the right to correct/alter the information if necessary at any stage.*

Annexure – I

A) Syllabus for written entrance test : M.Sc.(Physics)

Mathematical Methods: Calculus of single and multiple variables, partial derivatives, Jacobian, imperfect and perfect differentials, Taylor expansion, Fourier series. Vector algebra, Vector Calculus, Multiple integrals, Divergence theorem, Green's theorem, Stokes' theorem. First and linear second order differential equations. Matrices and determinants, Algebra of complex numbers.

Mechanics and General Properties of Matter: Newton's laws of motion and applications, Velocity and acceleration in Cartesian, polar and cylindrical coordinate systems, uniformly rotating frame, centrifugal and Coriolis forces, Motion under a central force, Kepler's laws, Gravitational Law and field, Conservative and non-conservative forces. System of particles, Centre of mass, equation of motion of the CM, conservation of linear and angular momentum, conservation of energy, variable mass systems. Elastic and inelastic collisions. Rigid body motion, fixed axis rotations, rotation and translation, moments of Inertia and products of Inertia. Principal moments and axes. Elasticity, Hooke's law and elastic constants of isotropic solid, stress energy. Kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem, viscous fluids, surface tension and surface energy, capillarity.

Oscillations, Waves and Optics: Differential equation for simple harmonic oscillator and its general solution. Superposition of two or more simple harmonic oscillators. Lissajous figures. Damped and forced oscillators, resonance. Wave equation, traveling and standing waves in one-dimension. Energy density and energy transmission in waves. Group velocity and phase velocity. Sound waves in media. Doppler Effect. Fermat's Principle. General theory of image formation. Thick lens, thin lens and lens combinations. Interference of light, optical path retardation. Fraunhofer diffraction. Rayleigh criterion and resolving power. Diffraction gratings. Polarization: linear, circular and elliptic polarization. Double refraction and optical rotation.

Electricity and Magnetism: Coulomb's law, Gauss's law. Electric field and potential. Electrostatic boundary conditions, Solution of Laplace's equation for simple cases. Conductors, capacitors, dielectrics, dielectric polarization, volume and surface charges, electrostatic energy. Biot-Savart law, Ampere's law, Faraday's law of electromagnetic induction, Self and mutual inductance. Alternating currents. Simple DC and AC circuits with R, L and C components. Displacement current, Maxwell's equations and plane electromagnetic waves, Poynting's theorem, reflection and refraction at a dielectric interface, transmission and reflection coefficients (normal incidence only). Lorentz Force and motion of charged particles in electric and magnetic fields.

Kinetic theory, Thermodynamics: Elements of Kinetic theory of gases. Velocity distribution and Equipartition of energy. Specific heat of Mono-, di- and tri-atomic gases. Ideal gas, van-der-Waals gas and equation of state. Mean free path. Laws of thermodynamics. Zeroeth law and concept of thermal equilibrium. First law and its consequences. Isothermal and adiabatic processes. Reversible, irreversible and quasi-static processes. Second law and entropy. Carnot cycle. Maxwell's thermodynamic relations and simple applications. Thermodynamic potentials and their applications. Phase transitions and Clausius-Clapeyron equation.

Modern Physics: Inertial frames and Galilean invariance. Postulates of special relativity. Lorentz transformations. Length contraction, time dilation. Relativistic velocity addition theorem, mass energy equivalence. Blackbody radiation, photoelectric effect, Compton effect, Bohr's atomic model, X-rays. Wave-particle duality, Uncertainty principle, Schrödinger equation and its solution for one, two and three dimensional boxes. Reflection and transmission at a step potential, tunneling through a barrier. Pauli exclusion principle. Distinguishable and indistinguishable particles. Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. Structure of atomic nucleus, mass and binding energy. Radioactivity and its applications. Laws of radioactive decay. Fission and fusion.

Solid State Physics, Devices and Electronics: Crystal structure, Bravais lattices and basis. Miller indices. X-ray diffraction and Bragg's law, Einstein and Debye theory of specific heat. Free electron theory of metals. Fermi energy and density of states. Origin of energy bands. Concept of holes and effective mass. Elementary ideas about dia-, para- and ferromagnetism, Langevin's theory of paramagnetism, Curie's law. Intrinsic and extrinsic semiconductors. Fermi level. p-n junctions, transistors. Transistor circuits in CB, CE, CC modes. Amplifier circuits with transistors. Operational amplifiers. OR, AND, NOR and NAND gates.

B) Syllabus for written entrance test : M.Sc. (Chemistry)

Atomic Structure, Periodic Properties, Pauling's And Mulliken's Scales Of Electronegativity, Covalent Bond : Valance Bond Theory, Various Types Of Hybridization and Shapes of Inorganic Molecules. MO Theory , s - & p - Block Elements , Interhalogen Compounds and Polyhalides , Chemistry of Noble Gases, Chemistry of Transition & Inner Transition Series Elements, Isomerism in Coordination Compounds, Metal Ligand Bonding In Transition Metal Complexes and Electronic Spectra, Magnetic Properties Of Transition Metal Complexes, Various Separation Techniques. Organometallic Chemistry , Bioinorganic Chemistry, Hard and Soft Acids and Bases.

Structure and Bonding, Inductive, Electromeric & Resonance Effect. Hyperconjugation, Mechanism of Organic Reactions, Reactive Intermediates Carbocations, Carbanions, Free Radicals, Carbenes, Nitrenes. Stereochemistry, Geometrical, Conformational Isomerism, Chemistry of Aliphatic Hydrocarbons, Arenes, Alkyl Halides , Alcohols , Phenols , Aldehydes and Ketones, Carboxylic Acids and Derivatives Of Carboxylic Acid , Nitrogen containing compounds, Ethers and Epoxides , Organometalic compounds , Chemistry Of 5 & 6 Membered Heterocyclic Compounds, Biomolecules, Synthetic Polymers, Synthetic Dyes , Organo Sulphur Compounds. Quantitative Analysis.

Gaseous State, **Solid State**, **Liquid State**, **Chemical Kinetics**, **Thermodynamics**: 1st law, 2nd law, Enthalpy, Entropy, Free Energy and Thermochemistry. **Electrochemistry**: Conductance and Potential Concepts, Solutions and Colligative Properties, Nernst Distribution Law, Ideal and Real Solutions, **Phase Rule**. **Quantum Mechanics**: Planck's Quantum Theory. Bohrs Model Of Hydrogen Atom. De Broglie's Hypothesis, HUP, Schrodinger Wave Equation, Quantum Numbers & Their Importance, Molecular Orbital Theory. **Dipole Moment , Magnetic Properties.**

Nuclear Chemistry: Nuclear Reaction, Nuclear Models , Applications Of Radioisotopes

Spectroscopy: UV, IR, NMR., **Raman Spectra** of diatomic Molecules, Polarizability, Selections Rules, **Photochemistry**, Fluorescence Phosphorescence, Chemiluminescence, Quantum Yield.

C) Syllabus for written entrance test for M.Sc. (Mathematics)

Calculus: Sequences of real numbers. Convergent sequences and series, absolute and conditional convergence. Continuity and differentiability. Roll's Theorem, Mean value theorem. Taylor 's theorem. Maxima and minima of functions of a single variable. Functions of two and three variables. Partial derivatives, maxima and minima. Fundamental theorem of integral calculus. Double and Triple, integrals, Surface areas and volumes.

Real Analysis : Open and closed sets, limit points, completeness of R, Uniform Continuity, Uniform convergence, Power series.

Vector Calculus : Gradient, divergence, curl and Laplacian. Directional Derivatives. Green's, Stokes and Gauss theorems and their applications.

Differential Equations : Ordinary differential equations of the first order of the form $y'=f(x,y)$. Orthogonal Trajectory. Linear differential equations of higher order with constant coefficients. Euler-Cauchy equation. Method of variation of parameters.

Linear Algebra : Systems of linear equations. Matrices, rank, determinant, inverse. Eigenvalues and eigenvectors. Finite Dimensional Vector Spaces over Real and Complex numbers, Basis, Dimension, Linear Transformations.

Algebra : Groups, subgroups and normal subgroups, Lagrange's Theorem for finite groups, group homomorphisms and basic concepts of quotient groups, rings, ideals, quotient rings and fields.

Analytical Geometry: Planes, Spheres, right circular Cones and right circular Cylinders.

Annexure II

A) Scheme for M.Sc. (Physics) : Two years (Four Semester Programme)

Sr No.	Semester	Subject Code	Name of the Subject	L	T	P	Credits
1	I	MAL516	Mathematical Physics	3	0	0	6
2	I	PHL511	Classical Mechanics	3	0	0	6
3	I	PHL512	Electronics-I	3	0	0	6
4	I	CSL 501	Computer Programming	3	0	0	6
5	I	PHL514	Communication Skills	2	0	0	Audit
6	I	PHP515	General Lab	0	0	6	6
7	I	CSP 501	Computer Programming	0	0	2	Audit
8	II	PHL521	Quantum Mechanics	3	0	0	6
9	II	PHL522	Electrodynamics	3	0	0	6
10	II	PHL523	Electronics-II	3	0	0	6
11	II	PHL524	Statistical Mechanics	3	0	0	6
12	II	PHL525	Thin Film Techniques	3	0	0	6
13	II	PHP526	Electronics Lab	0	0	6	6
14	III	PHL531	Solid State Physics	3	0	0	6
15	III	PHL532	Atomic & Molecular Physics	3	0	0	6
16	III	PHL533	Materials Science	3	0	0	6
17	III	PHL534	Nuclear and particle Physics	3	0	0	6
18	III	PHP535	Materials Science Lab	0	0	4	4
19	III	PH536	Seminar	-	-	-	2
20	III	PHL537	Project Phase -I	-	-	-	6
21	IV	PHL541	Characterization Techniques for Materials	3	0	0	6
22	IV	PHL542	Nano-materials	3	0	0	6
23	IV	PHL543	Characterization technique lab	0	0	4	4
24	IV	PHL544	Project Phase -II	-	-	-	8
			Total Credits				**126**

B) Scheme for M.Sc.(Chemistry) :Two years (Four Semester Programme)

Sr. No	Semester	Subject Code	Name of the Subject	Course Category	L	T	P	Credits
1	I	CHL 511	Molecular Thermodynamics	DC	3	-	-	6
2	I	CHL512	Principle of Organic synthesis	DC	3	-	-	6
3	I	CHL513	Quantum Chemistry and Atomic Structure	DC	3	-	-	6
4	I	CHL514	Main group and Transition metal chemistry	DC	3	-	-	6
5	I	CHP515	Inorganic Chemistry Lab	DC	-	-	6	6
6	I	CHP516	Organic Chemistry Lab	DC	-	-	6	6
7	I	HUL605	Communication Skill	AUDIT	3	-	-	Audit
8	I	CSL 501	Computer Programming	AUDIT	3	-	-	Audit
9		CSP 501	Computer Programming	AUDIT	-	-	2	Audit
10	II	CHL521	Electrochemistry and Dynamics of Chemical process	DC	3	-	-	6
11	II	CHL522	Stereochemistry and Organic reaction mechanism	DC	3	-	-	6
12	II	CHL523	Modern method of analysis	DC	3	-	-	6
13	II	CHL524	Organometallics and Catalysis	DC	3	-	-	6
14	II	CHP525	Analytical chemistry Lab	DC	-	-	6	6
15	II	CHP526	Physical Chemistry Lab	DC	-	-	6	6
16	III	CHL531	Application of Spectroscopic techniques for structure determination	DC	3	-	-	6
17	III	CHL532	Solid state and surface chemistry	DC	3	-	-	6
18	III	CHL533	Bioinorganic Chemistry	DC	3	-	-	6
19	III	CHP534	Computational Chemistry lab	DC	-	-	2	2
20	III	CHP535	Synthesis and Characterization lab	DC	-	-	6	6
21	III	CHP536	Project Phase I	DC	-	-	6	6
22	IV		Elective I	DE	3	-	-	6
23	IV		Elective II	DE	3	-	-	6
24	IV	ECL243	Basics of Electronics	OC	1	-	-	2
25		CHP560	Project Phase –II	DC	-	-	8	8
			Total Credits					**126**

Elective courses:	**Course Code**
Chemistry of Advanced materials	**CHL 541**
Chemistry and Technology Water	**CHL 542**
Sensors and Chemical sensors	**CHL 543**
Green chemistry and sustainability	**CHL 544**
Photochemistry and Pericyclic reaction	**CHL 545**
Chemistry of Heterocyclic Compounds	**CHL 546**
Supramolecular Chemistry	**CHL 547**
Biomolecules	**CHL 548**
Chemistry of Macromolecules	**CHL 549**

C) Scheme for M.Sc. (Mathematics): Two years (Four Semester Programme)

Sr. No.	Semester	Subject Code	Name of the Subject	L	T	P	Credits
1	I	MAL 511	Linear Algebra	3	-	-	6
2	I	MAL512	Real Analysis	3	-	-	6
3	I	MAL513	Theory of Ordinary Differential Equations	3	-	-	6
4	I	MAL514	Discrete Mathematics	3	-	-	6
5	I	CSL 501	Computer Programming	3	-	0	6
6	I	CSP 501	Computer Programming	0	-	2	Audit
7	I	HUL605	Communication Skill	3	-	-	Audit
8	II	MAL521	Complex Analysis	3	-	-	6
9	II	MAL522	Topology	3	-	-	6
10	II	MAL523	Algebra	3	-	-	6
11	II	MAL524	Partial Differential Equation	3	-	-	6
12	II	MAL525	Numerical Analysis	3	-	-	6
13	II	MAP526	Numerical Computation laboratory	-	-	2	2
14	III	MAL531	Functional Analysis	3	-	-	6
15	III	MAL532	Operations Research	3	-	-	6
16	III	MAL533	Fluid Dynamics	3	-	-	6
17	III	MAL534	Probability & Statistics	3	-	-	6
18	III		Elective-I	3	-	-	6
19	III	MAL551	Project Phase I	-	-	-	2
20	IV	MAL541	Measure Theory and Integration	3	-	-	6
21	IV	MAL542	Integral Transform and Integral Equations	3	-	-	6
22	IV		Elective-II	3	-	-	6
23	IV		Elective-III	3	-	-	6
24		MAD 552	Project Phase -II	-	-	8	8
				Total Credits			**126**

Electives in third Semester:
MAL535: Relativity
MAL536: Numerical Solutions of Differential Equations
MAL537: Mathematical Modeling

Electives in fourth Semester:
MAL543: Operator Theory
MAL544: Finite Element Methods
MAL545: Computational Fluid Dynamics
MAL546: Bio Mechanics
MAL547: Multivariate Data Analysis