

**Important Notes:**

- **Before applying, please ensure that you fulfil the eligibility requirements as prescribed above. Also please note that permission to appear in the entrance examination is strictly subject to your fulfilling the minimum eligibility requirements prescribed by each University as detailed above. You may, therefore, appear in the entrance examination only if you fulfil the eligibility requirements for M. Tech Biotechnology Programme. Despite this caution, in case you do not meet the minimum eligibility criteria and still appear in the entrance examination, you will do so at your own risk and cost, and if at any stage, it is found that you do not fulfil the minimum eligibility requirements, the admission, if granted to you, shall be cancelled ipso facto.**
- Number of seats is subject to change by the participating Universities.
- Candidates who are due to appear in the final semester/year of the qualifying examination shall also be considered for appearing in the entrance examination provided they have secured 60% or equivalent CGPA (under grading system) in previous semesters/year. However, in the event of their selection, the admission will be granted to them subject to their securing minimum 60% marks or equivalent CGPA in their qualifying examination.

**III. RESERVATION/CONCESSION**

- a) **Reservation:** 15%, 7½% and 3% of seats shall be reserved for Scheduled Caste (SC), Scheduled Tribe (ST) and Physically Challenged (Handicapped) (PH) candidates (with not less than 40% disability) respectively. All the SC/ST and PH candidates who have passed the qualifying examination are eligible to apply irrespective of their percentage of marks in the qualifying examination. **Only those SC/ST/PH candidates who have passed the qualifying examination in 2010 or thereafter including those who are appearing in 2012 are eligible to apply. In other words, those who have passed the qualifying examination PRIOR to 2010 are NOT eligible to apply. OBC reservation, wherever applicable, will be implemented as per the policy of each participating University.**
- b) **Concession for Kashmiri Migrants:** 10% marks will be added to the overall marks scored by a Kashmiri migrant candidate in the Entrance Examination. After adding 10% marks, in case he/she is covered in the cut-off point in the merit list, he/she will be offered admission strictly in accordance with his/her inter-se merit along with other candidates subject to his/her meeting the minimum prescribed eligibility requirements and also subject to his/her producing valid registration documents issued by the notified authorities certifying the candidate's Kashmiri Migrant status.

**IV. GUIDELINES FOR ENTRANCE EXAMINATION**

The question paper for Entrance Examination will be of 3-hours duration consisting of Two Streams: (i) Technology Stream and (ii) Life Sciences Stream.]

**(i) Technology Stream :**

- Part A : Basic Engineering & Technology.....at under graduate level  
 Part B : Physics/Chemistry/Maths.....at under graduate level  
 Part C : Fundamental Life Sciences and Informatics.....at 10+2 level

**(ii) Life Science Stream:**

- Part A : Life Sciences (Biochemistry, Molecular Biology & Immunology).....at post graduate level  
 Part B : Physics/Chemistry.....at undergraduate level  
 Part C : Maths, Computer & Information Sciences.....at 10+2 level.

**V. SYLLABUS****Section I****Technology/Engineering Stream****Part A****(Basic Engineering and Technology Pharmacology)****i) Basic Engineering and Technology**

Basic concepts/principles in mechanical engineering, electrical and electronics engineering:

**Chemical Engineering:** Computer applications in chemical engineering- chemical process industries instrumentation methods of chemical analysis- thermodynamics- stoichiometry- fluid dynamics- mechanical operations- heat and mass transfer operations- chemical kinetics/reaction engineering- process instrumentation dynamics and control- process equipment design.

**Principles of Biochemical Engineering:** Enzyme catalysis (Michaelis-Menten Kinetics) and reactor design. Material & energy balances of fermentation processes. Kinetics of microbial growth and product formation (Monod model-Leudekings-Piert model). Nature of fermentation processes. Transport phenomena in biochemical reactors- Mass transfer in immobilized enzyme systems and Oxygen transfer in submerged fermentation process, examples of primary metabolites, secondary metabolites and enzymes. Bioreactor operation and design, reactor sterilization. Batch, fed-batch and continuous culture process and cell recycle processes. Modelling of non-ideal behavior in bioreactors. Novel bioreactors, air-lift reactors, membrane bioreactors and fluidized bed reactors. Filtration and membrane based separations, centrifugation, extraction, absorption and chromatography.

(ii) **Pharmacology**

**Physiology, Pharmacology & Biochemistry:** Basic physiology and biochemistry pertaining to all the systems in the body. Classification, mode of action, pharmacological effects, side effects, toxicity and posology of drugs acting on the CNS, ANS, CVS, gastrointestinal system, endocrine system. Principles of chemotherapy, chemotherapeutic agents, anticancer drugs, vitamins and minerals.

**Industrial Pharmacy :** Pharmaceutical processing - mixing, milling, drying, powder compression, clarification, filtration, Rheology, sterilization, sterility testing, disinfection, Pharmaceutical dosage forms : Formulation, manufacture and evaluation of solid, semisolid, liquid, aerosols and parenterals. Chemistry of natural products, SAR and Chemistry of analgesics, anticancer, CVS drugs, drugs acting on the CNS, GIT, chemotherapeutic agents, vitamins, hormones.classification, identification, extraction and isolation of active principles of commonly used medicinal plants. Immunological preparations, genetic engineering, fermentation. Biopharmaceutics, Pharmacokinetics-drug absorption, distribution, metabolism and elimination- general principles. Basic concepts of analysis of drugs.

**Section I**

**Technology/Engineering Stream**

**Part - B**

**(Physics, Chemistry and Mathematics)**

**Mathematics:**

Calculus - Differential Equation- Complex numbers- Complex integration- Power series- Three Dimensional Geometry-Algebra.

**Physics:**

**Mechanics:** Kinematics- Newton's laws - work and mechanical energy- dynamics of rotary motion- fundamentals of special theory of relativity- gravitation- motion in non-inertial frames.

**Thermodynamics:** Ideal gases- 1st law of thermodynamics- Kinetic theory of gases- 2nd law of thermodynamics -real gases.

**Electricity and Magnetism:** Electrostatics- Coulomb's law- electric field potential- capacitance- dielectrics in an electric field- energy of an electric field- direct current- magnetic field of direct current- - eletromagnetic induction.

**Waves and Optics:** Free harmonic oscillators- elastic waves- electromagnetic waves- interference, diffraction, scattering and polarisation of light- thermal radiation.

**Modern Physics:** Structure of matter and basic solid state physics - elementary nuclear physics- elementary quantum mechanics- structure of atom.

**Chemistry:**

**Inorganic chemistry:** Electronic structure of atoms, periodic table and periodic properties. General characteristics, structure and reactions of non-transition elements and transition elements. Coordination compounds, structure, crystal field and ligand field theories, spectral and magnetic properties.

**Organic chemistry:** Synthesis, reactions and mechanisms of alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids and their derivatives, halides, nitro compounds and amines. Structure and properties of biomolecules, carbohydrates, amino acids and proteins.

**Physical chemistry:** Chemical equilibrium, first law, thermochemistry, second law and entropy, free energy, properties of dilute solutions. chemical kinetics, rates of reactions and factors affecting rates of reactions. Spectroscopy, principles of UV- visible and IR spectroscopy.

**Section I**

**Technology/Engineering Stream**

**Part C**

**(Fundamentals of Life Sciences and Informatics)**

**Life Sciences:** Organization of unicellular organisms, invertebrates and vertebrates. Ultrastructure of plant and animal cells. Nucleic acids, protein synthesis, Mendalian genetics. Morphology of angiosperms. Biotechnology, Physiology.

**Information Technology:** Introduction to www.Networking: Basics-modem-hub-switch-commands to transfer files-remote login. Elements of languages used on the Internet JAVA- Perl. Elements of databases- Relational databases.

## Section II

### Science Stream

#### Part A

##### Life Sciences

**Biochemistry:** Cell structure and function; protein synthesis; genetic code; DNA & RNA; carbohydrate, protein and lipid metabolism, clinical biochemistry; In born erros of metabolism; hormones and their function.

**Molecular biology & recombinant DNA technology:** Properties of nucleic acids, chromosomes, DNA replication, damage and repair, gene manipulation, cloning vectors, gene libraries, screening of libraries, gene cloning, applications of recombinant DNA technology, PCR, RFLP, Western, Northern and Southern blotting.

**Immunology :** Cells of the immune system, lymphoid tissues, complement, antibodies, hybridoma technology, applications of monoclonal antibodies, antigen recognition, processing and presentation, cell mediated immunity, cytokines, hypersensitivity, vaccine technology, auto-immunity, transplantation, immune responses to various infections, Immunotechnology.

## Section II

### Science Stream

#### Part B

##### (Physics and Chemistry)

##### Physics:

**Mechanics :** Kinematics- Newton's laws- work and mechanical energy- dynamics of rotary motion- fundamentals of special theory of relativity- gravitation- motion in non-inertial frames.

**Thermodynamics:** Ideal gases – 1st law of thermodynamics- Kinetic theory of gases- 2nd law of thermodynamics- real gases.

**Electricity and Magnetism :** Electrostatics- Coulomb's law- electric field potential- capacitance- dielectrics in an electric field- energy of an electric field- direct current- magnetic field of direct current- electromagnetic induction

**Waves and Optics:** Free harmonic oscillators- elastic waves- Electromagnetic waves- interference, diffraction, scattering and polarisation of light- thermal radiation.

**Modern Physics:** Structure of matter and basic solid state physics- elementary nuclear physics- elementary quantum mechanics- structure of atom.

##### Chemistry:

**Inorganic Chemistry:** Electronic structure of atoms, periodic table and periodic properties. General characteristics, structure and reactions of non- transition elements and transition elements. Coordination compounds, structure, crystal field and ligand field theories, spectral and magnetic properties.

**Organic Chemistry:** Synthesis, reactions and mechanisms of alkenes, alkynes, arenes, alcohols, phenols, aldehydes, ketones, carboxylic acids and their derivatives, halides, nitro compounds and amines. Structure and properties of biomolecules, carbohydrates, amino acids and proteins.

**Physical Chemistry:** Chemical equilibrium, first law, thermochemistry, second law and entropy, free energy, properties of dilute solutions. Chemical kinetics, rates of reactions and factors affecting rates of reactions. Spectroscopy, principles of UV-visible and IR spectroscopy.

## Section II

### Science Stream

#### Part C

##### (Mathematics, Computer and Information Sciences)

**Mathematics:** Vectors- Trigonometry- Differentiation & Integration- Matrices

**Information Sciences:** Introduction to www. Networking: Basics-modem-hub-switch-commands to transfer files-remote login. Elements of languages used on the Internet JAVA- Perl. Elements of databases- Relational database.

**Computer Application:** Basics of computers-hardware-components of a computer. Operating systems- windows-linux- simple commands. Elementary Boolean arithmetic- subtraction- addition- multiplication. Applications- word processing- spread sheets. Elementary basic programming commands and syntax. ;

## VI. PREVIOUS YEARS' QUESTION PAPERS

For the reference of intending candidates, a set of question papers pertaining to the last five years has been prepared. In order to meet the processing and printing charges, the cost of a set of five years' question papers has been fixed as under :

- |     |                 |   |          |
|-----|-----------------|---|----------|
| (1) | At Cash Counter | : | Rs.150/- |
| (2) | By Post:        | : | Rs.310/- |

Those who wish to obtain this set of five years question papers by post may write to the Section Officer (Admissions), Jawaharlal Nehru University, New Delhi-110067 alongwith a Bank Draft for Rs.310/- drawn in favour of "**Jawaharlal Nehru University**", payable at New Delhi and a self-addressed unstamped envelope of not less than 30x25 cm. mentioning clearly on the top of the envelope "**Request for M.Tech Biotechnology Previous Years Question Papers**" before 11<sup>th</sup> April 2012. However last date for issue of sets of question papers at Cash Counter will be 30<sup>th</sup> April 2012. **Please note that even though questions will be of multiple choice, the pattern may change from year to year.**

## VII. SELECTION PROCEDURE

Selection of the candidates will be done in accordance with their inter-se merit drawn on the basis of All India Entrance Examination vis-à-vis the preference of Universities exercised by candidates. In case a candidate has not indicated his/her option for joining a particular university, his/her name will not be considered for that university.

**The Selection procedure will be as follows:**

- 1) After the merit list is drawn more than double the number of candidates than the total intake only will be informed of their merit rank in the entrance examination. The candidates will also be informed about the total number of seats in each participating University. The candidates will be asked to exercise their final options for joining the Universities in the proforma (which will be sent by JNU). The candidates will be asked to send to JNU a Bank Draft of Rs.5,000/- ( Rs.2,500/- in the case of SC, ST, PH candidates) **as initial security deposit** giving their willingness to be considered for admission to the participating Universities in accordance with their options for joining the Universities vis-à-vis their inter-se merit in the Entrance Examination. **ALL CANDIDATES ARE ADVISED TO CHECK THE RESULT ON THE WEB SITE OF THE UNIVERSITY (www.jnu.ac.in) IN THE SECOND WEEK OF JUNE.**
- 2) The candidates who do not exercise their options for joining any of the participating universities will not be considered for admission to that university/universities.
- 3) After allotment of seats, the JNU will send intimation to the candidates about their allotment of the university and also to the concerned participating university to which the candidate has been selected. Please note that once allotment of University is made on the basis of inter se merit vis-à-vis options, other options of the universities given by the candidate shall stand frozen. **CANDIDATES ARE ADVISED TO CHECK THE ALLOTMENT OF UNIVERSITY ON THE WEB SITE OF THE UNIVERSITY (www.jnu.ac.in) IN THE FIRST/SECOND WEEK OF JULY.**
- 4) The participating university will then inform the candidate about the complete admission procedure and schedule of their university as well as the amount of fee etc. to be deposited by the candidate. The initial security deposit already sent by the candidate through demand draft to JNU will be sent to concerned University for refund to the students after first semester.
- 5) In case the candidate is offered admission in accordance with his/her options for joining the universities vis-à-vis his/her inter-se merit, but subsequently in case he/she either does not join the concerned university or withdraws during first semester then in that event, the initial security deposit of Rs. 5,000/- or Rs.2,500/- in case of SC,ST, PH categories, as the case may be, will stand forfeited.
- 6) The initial security deposit of Rs.5,000/-, (Rs.2,500/- in the case of SC/ST, PH candidates) will be refunded in full to those of the candidates who are not offered admission to any of the participating university.
- 7) **Candidates may note that request for transfer from one university to another will not be entertained under any circumstances. Therefore, candidates are advised not to make any request in this regard.**
- 8) Only those candidates who will be asked to exercise their option will be informed by post/telegram and the list of these candidates will also be available on JNU website (www.jnu.ac.in). However, the candidates are advised to find out through their own sources whether their names appear in the list and thereby make arrangement for sending their option together with initial security deposit by the stipulated date. **The University will not be responsible for any delay/lapse on the part of postal/telegram Department.**

- 9) PLEASE NOTE THAT ONLY ONE MERIT LIST WILL BE RELEASED AND THERE WILL BE NO SECOND LIST UNDER ANY CIRCUMSTANCES.

### VIII. ADMIT CARD FOR ENTRANCE EXAMINATION

The candidates may download their Admit Card from the University's website: [www.jnu.ac.in](http://www.jnu.ac.in) after 10<sup>th</sup> May 2012 and take the Admit Card to the Examination Centre with a copy of latest passport size photograph.

Before taking the entrance examination, please ensure that you fulfil the eligibility requirements as prescribed by the University. Also please note that permission to appear in the entrance examination is subject to your fulfilling the minimum eligibility requirements prescribed for admission as notified in the prospectus. You may, therefore, appear in the entrance examination only if you fulfil the eligibility requirements as prescribed for M.Tech Biotechnology Programme under Section-II of this prospectus. Despite this caution, in case you do not meet the minimum eligibility criteria and appear in the entrance examination, you will do so at your own risk and cost, and if at any stage, it is found that you do not fulfil the minimum eligibility requirements, the admission, if granted to you, shall be cancelled ipso facto.

Those candidates who have applied and fulfil the prescribed eligibility conditions but somehow are able to download the Admit Card are advised to contact either the JNU Representative (who will be available at the Examination Centre at least a day in advance) or the Presiding Officer/Principal of the Centre to sort out the problems. It may be noted that only those candidates will be allowed to appear in the entrance examination whose names appear in the roll-list available with the examination centre. The University will assume no responsibility whatsoever in case the candidate fails to report on the due date and time for appearing in the entrance examination.

### IX. TIME-TABLE FOR ENTRANCE EXAMINATION/ADMISSION

1. Issue of Application Forms (only by post)	6th February, 2012
2. Last date for issue of Application Forms (only by post)	5th March, 2012
3. Last date of submission of completed Application Form to reach JNU	21st March, 2012
4. Date and time of Entrance Examination	May 25, 2012 (2.00 P.M. to 5.00 P.M.)
5. Results of Entrance Examination	June/July 2012
6. For admission/result queries candidate may visit our website	<a href="http://www.jnu.ac.in">www.jnu.ac.in</a>

Although University will inform the candidates falling under consideration zone about their merit by post/telegram, it is the responsibility of the candidate to see the result on University website. University will not be responsible for any delay/lapse on the part of postal/telegraph Department.

### X. HOSTEL FACILITIES

The outstation candidates admitted to the programme of study of the participating Universities will be considered for hostel accommodation as per rules of the concerned University subject to availability of hostel accommodation. Students may please note that grant of admission in a University would not ensure automatic allotment of hostel accommodation and that the same will be offered subject to its availability.

### XI. CERTIFICATES AND OTHER DOCUMENTS REQUIRED AT THE TIME OF ADMISSION

- Two copies of the Matriculation, Higher Secondary Pre-University of Indian School Certificate or Senior School Certificate (10+2) or an equivalent examination certificate, showing the age/date of birth of the candidate duly attested by the Principal of the College/School last attended or a Gazetted Officer;
- A Character Certificate from the Head of the Institution last attended;
- Two attested copies of the statement of marks obtained by the candidate in Senior School, Bachelor's Degree/Master's Degree examination etc; or their equivalent examination;
- Two attested copies of the Bachelor's Degree and/Master's Degree;
- SC/ST/OBC Certificate, if belonging to SC/ST/OBC category

- (f) A Medical Certificate for PH Candidates certifying that the disability is not less than 40%.
- (g) Migration Certificate (in original) from the Head of the Institution/University last attended:

**Important: The candidates are also required to produce all originals of the above certificates/documents for verification at the time of registration/admission. In the absence of any of the original certificates/documents, registration/admission shall not be allowed.**

## XII. INSTRUCTIONS FOR COMPLETING THE APPLICATION FORM

### Notes:

- a) Please read the Check List given in the inside front cover of the brochure before filling-up the Application Form.
  - b) Please fill the form in your own handwriting.
  - c) Please note down your Application Form Number for future correspondence or retain a photocopy of the filled in Application Form.
  - d) The Application Form is to be filled in by the candidate **IN BLACK INK ONLY** giving complete information using capital letters as far as possible. Please read carefully the instructions given hereunder before filling up the form. Refer to the sample of a filled-in Application Form given in the prospectus. Note especially the right method to darken the bubbles as shown in the Sample Application Form.
  - e) First, write in black ink (using capital letters) the required information in the boxes (wherever provided). Then darken the appropriate bubble corresponding to the letter/numeral underneath each box. What you write in these boxes is only for your guidance and verification that you are darkening the bubble corresponding to the correct letter/numeral.
  - f) If you wish to change a marking, completely cover the darkened bubble with white fluid, and then darken the appropriate bubble.
  - g) Please note that your name, your parent's/guardian's name, and your date of birth should exactly be the same as given in your 10th class or first Board/Pre-University examination certificate. Any deviation, whenever discovered, may lead to cancellation of your candidature.
1. **Name of the Candidate:** Write your name in capital letters as given in your 10th class certificate or your first Board/Pre-University Examination. Write a only one letter in each box. Leave one, **and only one**, blank box between consecutive words of your name. Darken the appropriate bubble underneath each letter of the name. If your name has several initials, leave one bubble blank after each of them.
  2. **Date of Birth :** Darken the bubbles to indicate date of birth exactly same as given in your High School or your first Board Examination in terms of day, month and year. Use numeral 01 to 31 for date, use numerals 01 to 12 for month and use last two digits for the year of birth.
  3. **Gender:** Darken the appropriate bubble.
  4. **Nationality:** Darken the appropriate bubble. In case you are a Foreign National, please indicate the country to which you belong in the space provided.
  5. **Category:** Darken the bubble corresponding to your category/categories as given below. **Your request for change of category subsequent to your submission of Application Form will not be accepted.**

Category	Code
General	G E N
Scheduled Caste	S C
Scheduled Tribe	S T
Other Backward Class ( Only Non Creamy Layer) as per Central list	O B C

- 5(a). If you belong to OBC of Minority Community, darken the bubble, otherwise leave it blank.
6. **PH Category:** In case you are a candidate with a minimum of 40% disability, darken the bubble corresponding to your Physical Handicapped category as given below. Otherwise leave it blank.
- |                            |   |    |
|----------------------------|---|----|
| Hearing Handicapped        | : | HH |
| Orthopadeicaly Handicapped | : | OH |
| Visually Handicapped       | : | VH |
7. In case you are Kashmiri Migrant, darken the bubble, otherwise leave it blank.