<u>INFORMATION BULLETIN</u>

ADMISSION TO

M. Sc. / M. Sc. Tech. Programmes
2016 – 2017

INDIAN SCHOOL OF MINES

DHANBAD – 826004, JHARKHAND, INDIA

(Declared as Deemed-to-be-University U/S 3 of the UGC Act, 1956 vide Notification No. F11-4/67-U3, dated 18.9.1967 of Govt. of India)

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PART I

GENERAL INFORMATION

1.1 HISTORY

Indian School of Mines (I.S.M.) was established in 1926 as a Premier Institute in the country for teaching Mining and Geology. In 1967, the institution was granted the Deemed University Status under University Grants Commission Act, 1956, and subsequently was placed under MHRD, Government of India, in 1996. This premier institute of mineral sciences and technology in the country celebrated its Platinum Jubilee in December 2001. Honorable Union Finance Minister on 28th Feb. 2015 in his budget speech has announced that ISM Dhanbad will be upgraded as full-fledged IIT.

1.2 LOCATION

I.S.M. is located at Dhanbad (the heart of major Indian coalfields) in the state of Jharkhand. The campus covers an area of 88 hectares (208 acres), and is composed of graceful blend of old and new style buildings for its academic departments, hostels, faculty and staff quarters in the peaceful surrounding right within the district town of Dhanbad.

1.3 ORGANISATIONAL SET-UP

I.S.M., an autonomous organization, has a General Council with representatives from various industrial and government sectors, both Houses of Parliament and its own academic community. The main governing body of I.S.M. is its Executive Board. The Academic Council, headed by the Director, looks after academic matters.

1.4 DEPARTMENTS

For imparting specialized education, research and training, the I.S.M. has following Departments:

1. Applied Chemistry	10. Electronics Engineering
2. Applied Geology	11. Environmental Science & Engineering
3. Applied Geophysics	12. Fuel & Mineral Engineering
4. Applied Mathematics	13. Humanities & Social Sciences
5. Applied Physics	14. Management Studies
6. Chemical Engineering	15. Mechanical Engineering
7. Civil Engineering	16. Mining Engineering
8. Computer Science & Engineering	17. Mining Machinery Engineering
9. Electrical Engineering	18. Petroleum Engineering

1.5 CENTRAL FACILITIES

The central facilities of the I.S.M. include Central Library, Computer Centre, Workshop, Physical Education Centre, Reprographic & Photographic Centres, Yoga club, Swimming Pool, NCC, NSS and Health Centre. A shuttle bus service is also available for easy transportation within the campus.

1.6 ACADEMIC PROGRAMMES

The I.S.M. offers the following courses:

A. 4-Year B. Tech. degree in:

1. Chemical Engineering	7. Engineering Physics
2. Civil Engineering	8. Environmental Engineering
3. Computer Sciences & Engineering	9. Mechanical Engineering
4. Electrical Engineering	10. Mineral Engineering
5. Electronics & Communication Engineering	11. Mining Engineering
6. Electronics & Instrumentation Engineering	12. Mining Machinery Engineering
	13. Petroleum Engineering

B. 5-Year Dual Degree Course in (i) Computer Science & Engineering with M. Tech. in Computer Science & Engineering (ii) Mineral Engineering with M. Tech. in Mineral Engineering, (iii) Mining Engineering with MBA, (iv) Mining Engineering with M. Tech in Mining Engineering, and (v) Petroleum Engineering with M. Tech. in Petroleum Engineering

C. 5-Year Integrated M. Tech Courses in (i) Applied Geology, (ii) Applied Geophysics, (iii) Mathematics and Computing.

Admissions in the above courses, **A, B & C**, are made through IIT Joint Entrance Examination.

D. 2-Year M. Sc. degree in (i) Chemistry, (ii) Mathematics and Computing, (iii) Physics, and **3-Year M. Sc. Tech. degree in** (i) Applied Geology and (ii) Applied Geophysics. Admission in these courses is made through All India Entrance Examination conducted by I.S.M.

E. Beside these degree programmes, I.S.M. also offers **2-Year M.B.A. programme**. Admission to this programme is through CAT score followed by Group Discussion and Interview. A **3-Year Executive MBA programme** for employed candidates as part time course is also offered.

F. A large number of **M. Tech. programmes** are also offered in accordance with UGC/AICTE guidelines. Admission to these programmes is through GATE score. A limited number of Non-GATE applicants are also admitted through an All India Level written test conducted by I.S.M.

1.7 RESEARCH PROGRAMMES

The I.S.M. awards Ph. D. degree in all existing disciplines, viz., Engineering, Applied Sciences, Humanities and Management. The selection of Junior Research Fellow is through an all India examination and interview. **I.S.M. also allows direct entry of M.Sc. Tech. & M.Sc. students into Ph.D. Programme. Under this scheme, top 20% of M.Sc. Tech. /M.Sc. students of respective Departments who obtain an OGPA of 8.5 and above, can apply for direct admission in Ph. D. programme, with the limit that each Department can have up to a maximum of 10 seats for all the courses offered by that Department taken together.**

1.8 MEDIUM OF INSTRUCTION

The medium of instruction in all courses is ENGLISH.

1.9 SEMESTER SYSTEM

The I.S.M. follows semester and grading systems in all disciplines. An academic year is composed of two semesters. Student's performance is continuously evaluated from the beginning of the semester, based on quizzes, home assignments, tutorials, mid-semester examination, field-training, group discussions and seminars, as applicable. Sessionals carry 40% weightage in respective subjects. ISM is also running a Summer semester program during summer vacation period (May-June). The student who fails in regular semester examination (Monsoon and Winter) will have to register for the Summer semester to clear the backlog papers. However, no student can take more than 5 papers including both the semesters (Monsoon and Winter) in the Summer semester. If the number of backlog papers is more than 5, the student has to repeat the respective semester.

1.10 ATTENDANCE REQUIREMENT

To appear in each semester examination, a student must have **at least 75% attendance in each subject**. Those who fails to get 75% attendance will have to register for the Summer semester.

1.11 FEE STRUCTURE (TENTATIVE), FINANCIAL AID AND SCHOLARSHIPS
A) M.Sc./M.Sc. Tech programmes:
Tentative Fee Structure of M.Sc./ M. Sc. Tech**.** Programmes 2015-2016

M.Sc. / M.Sc. Tech. Programmes		
Semester	GE/ OB/ DP /JK /PS / PD	SC/ST
I (At the time of Admission)	₹ 30,700/- (₹ 5000/- refundable)	₹ 22,700/-(₹ 5000/- refundable)

A good number of scholarships are available for deserving students. All eligible SC/ST students are awarded scholarship and are exempted from tuition fee. Students with good academic record are eligible for UGC scholarship of Rs. 1,000/- per month in the **third** year of M. Sc. Tech. programmes.

The fees structure is subject to change from time to time. **The students are also required to deposit the yearly mess fees of ₹ 30,000/- (subject to change) in advance in the account of their respective hostel account at the time of admission**.

1.12 HOSTEL FACILITY

I.S.M. is a fully residential campus with hostel accommodation for the students**.** It has separate hostels for girl students. Students having their residence within municipality limit of Dhanbad will not be provided hostel accommodation.

1.13 DISCLAIMER

This website has been launched to provide candidates and public-at-large, information about ISM M. Sc. / M. Sc. Tech Admission. If you do not agree to the terms and conditions below, do not access this site or any pages thereof.

Terms and Conditions:
Information displayed on the site, including text, graphics, links or other items - are provided on an "As Is" and "As Available" basis. Although, ISM M. Sc. / M. Sc. Tech Admission 2016 Committee which organizes and conducts examination tries to provide information accurately it expressly disclaims liability for errors or omissions thereon. No warranty of any kind, implied, express or statutory, including but not limited to the warranty of fitness for a particular purpose and freedom from computer virus, is given in conjunction with the information.

Limitation of Liability

In no event, ISM will be liable for any damages, including without limitation, direct or indirect, special, incidental, or consequential damages, losses, or expenses arising in connection with this site or use thereof or inability to use by any persons, or in connection with any failure of performance, error, omission, interruption, defect, delay of operation or transmission, computer virus or line or system failure, even if ISM or any representative thereof is advised of the possibility of such damages, losses or expenses.

Network Services

The ISM M. Sc. / M. Sc. Tech. Admission committee cannot be held responsible for reduced access speeds due to bandwidth overloads especially close to the submission date.

1.14   JURISDICTION

Any legal matter related to M. Sc. / M. Sc.Tech. Entrance examination will be subjected to Dhanbad Jurisdiction only.

PART II
ADMISSION PROCEDURE

2.1 IMPORTANT DATES

Opening date & time of online application:	**29th February 2016 (Monday),** 11.00 A.M.
Closing date & time of online application:	**11th April, 2016 (Monday)**, 12.00 Midnight.
Last Date of depositing fees online:	**11th April, 2016 (Monday)**
Last date for receipt of completed application form at ISM	**18th April(Monday), 2016, 05.00 PM**
Date and time of Entrance Examination:	**15th May, 2016 (Sunday),** 09.00 A.M. to 12.00 Noon (M.Sc/M.Sc Tech.)

CENTRES OF EXAMINAION

Bhubaneshwar, Chennai, Dhanbad, Guwahati, Hyderabad, Indore, Kolkata, Lucknow, New Delhi, Pune and Varanasi.

2.2 APPLICATION & ADMIT CARD

Information Bulletin can be downloaded from I.S.M. website www.ismdhanbad.ac.in from **29th February, 2016.** The application form should be filled up online through I.S.M. website. After filling the details on the application form, applicants are required to submit the application online and take a printout of the system generated application form. The candidates are required to send the printout of the system generated application form, payment receipt (₹ 1000/- for **SC/ST/PD** candidates only and ₹ 2,000/- for **all other categories** of candidates), photocopies of all certificates and mark sheets to the office of the **Assistant Registrar (Academic), Indian School of Mines, Dhanbad-826004, Jharkhand** on or before **18th April, 2016**. The envelope containing the print out of system generated application form and all other relevant documents should be superscribed as **"Admission to M.Sc. /M.Sc. Tech 2016".**

Admit cards will be available online and printout of this admit card has to be produced at the time of examination. I.S.M. will not send separate admit card to the candidates. All future correspondence should be addressed to Assistant Registrar (Academic), I.S.M., Dhanbad-826004, Jharkhand.

Note: Application fee, under any circumstances, will not be refunded. Applicants are advised to ensure fulfillment of all eligibility criteria before applying.

2.3 ELIGIBILITY, SUBJECTS OF EXAMINATION AND AGE LIMIT

Eligibility and subjects of Examination are given are as follows:

At least 55% aggregate marks, without rounding off, (in Honors/Major/Main subject only) for Un-Reserved/OB Category Candidates and at least 50% aggregate marks, without rounding off, (in Honors/Major/Main subject only). Honors/Major/Main subject must have weightage higher than the other subsidiary subjects. The subject combination for each of the program given in the following table:

M.Sc/M.Sc Tech. Programmes

Name of the Course	Minimum qualification for Examination	Subject of Entrance Examination
3-year M. Sc. Tech. (Applied Geology)	B.Sc. Degree (3-year) with Geology as Honours/ Major/ Main/ Equivalent subject and any two subsidiary subjects from Mathematics, Physics and Chemistry.	Geology
3-year M. Sc. Tech. (Applied Geophysics)	B.Sc. Degree (3-year) with Physics as Honours/ Major/ Main/ Equivalent subject, Mathematics as a subsidiary subject for two years/four semesters and another subsidiary subject from Chemistry, Geology, Electronics, and Statistics for one year/two semesters.	Physics

2-year M. Sc. (Physics)	B.Sc. Degree (3-year) with Physics as Honours/ Major / Main/ Equivalent subject, Mathematics as a compulsory subsidiary subject for one year/two semesters, or Mathematics as Honours / Major/ Main/ Equivalent subject with Physics as a subsidiary subject and another subsidiary subject from Chemistry, Geology, Statistics, Electronics, Computer Science, Economics and Geography, Environment and Water Management.	Physics
2-year M. Sc. (Chemistry)	B.Sc. Degree (3-year) with Chemistry as Honours/ Major / Main/ Equivalent subject, Mathematics as a compulsory subsidiary subject for one year/two semesters and another subsidiary from Physics, Geology, Zoology and Botany.	Chemistry
2-year M. Sc. (Mathematics & Computing)	B.Sc. Degree (3-year) with Mathematics as Honours / Major/ Main/ Equivalent subject and two subsidiary subjects from Physics, Chemistry, Geology, Statistics, Electronics and Computer Science.	Mathematics

Note: In all the above courses, 4-yr B. Sc. B. Ed. Degree applicants are also eligible provided they also satisfy the above requirements. The term 'Equivalent' means a subject having higher weightage than other two subsidiary subjects. The students applying for AGP course should ensure that they have done Mathematics (with Mathematics as subject code not Physics code)as subsidiary subject for 2Yrs/4 semesters.

The question paper will contain multiple choice objective type questions of hundred marks from the relevant subject of Entrance Examination with negative marking. **The medium of examination is English.**

Applicants appearing in qualifying examination by May 2016 are also eligible to apply. If selected, they have to produce B.Sc. final year/semester mark sheet along with all previous years/semesters mark sheets at the time of their admission at ISM, Dhanbad. The selected candidates should not have any backlog/carry over/supplementary in any of the semester/year at the time of admission.

Applicant, born on or after **October 1, 1992** is eligible for admission. Age limit for SC/ ST/ PD applicant is relaxed by 5 years and that of OBC applicants is relaxed by 3 years.

2.4 RESERVATION OF SEATS

(i) 15% seats are reserved for Scheduled Caste applicants, 7.5% for Scheduled Tribe applicants, 27% for OBC (non-creamy layer) applicants and 3% for PD (Physically Disabled) applicants as per the directives of the Government of India.

(ii) One seat each for (i) J&K migrants (JK), (ii) wards of defense personnel (DP), (iii) Parsi (PS) applicants is reserved in various M.Sc./M.Sc. Tech courses and any other reservations as per Govt. of India rules.

(iii) Authorities competent to issue caste certificate of SC/ ST/ OBC (non-creamy layer) status include:
- District Magistrate / Additional District magistrate / Collector / Deputy Commissioner / Additional Deputy Commissioner / Deputy Collector / First Class Stipendiary Magistrate / Sub-Divisional Magistrate / Taluka Magistrate / Executive Magistrate / Extra Assistant Commissioner (not below the rank of First Class Stipendiary Magistrate);
- Chief Presidency Magistrate / Additional Chief Presidency Magistrate / Presidency Magistrate;
- Revenue Officer not below the rank of Tehsildar; and
- Sub-Divisional Officer of the area where the applicant and / or his / her family normally resides.
[G.I. Dept. of Per. & Trg., Lr. No. 36012/22/93-Estt. (SCT), dated 15. 11. 1993].

(iv) The OBC certificate should also indicate that he/she does not belong to the persons / sections (creamy layer) mentioned in the column 3 of the Schedule to the GOI, Department of Personnel & Training O. M. No. 36012/22/93-Estt.(SCT) dated 08/09/2003 which is modified vide O.M. No. 36033/3/2004 Estt. (Res) dated 09/03/2004 and O.M.No.36033/3/2008 Estt.(Res) dated 14/10/2008.
OBC Applicants should attach an attested photocopy of valid and recent OBC (Non Creamy Layer) certificate in Govt. of India format only from competent authority which should not be older than six months from the last date of submission (18th April 2016) of applications, i.e. the OBC (NCL) certificate must be issued on or after 18th October 2015. Otherwise the applicant will not get the benefit of OBC-NCL category. The selected candidates without valid OBC-NCL certificate in Govt. of India format will be denied admission. No undertaking will be allowed in this regard.

2.5 MEDICAL STANDARD OF FITNESS
Applicant must be medically fit as per I.S.M. rules given in **PART V** of Information Bulletin and submit a medical fitness certificate in the format attached with Information Bulletin at the time of admission. Besides, he/she will also undergo medical examination arranged by I.S.M. at the time of admission.
2.6 PUBLICATION OF RESULT

The examination results will be published in June 2016. Only successful candidates will be informed. One may also check the result on I.S.M. website (**http://www.ismdhanbad.ac.in**).

2.7 NUMBER OF SEATS AVAILABLE

The number of seats available in the courses offered by I.S.M. for the academic session 2016-17 is given below.

Sl. No.	Course	Subject code for EE-16	GE	SC	ST	OB	Total	PD
1.	3-year M.Sc. Tech (Applied Geology)	GL	31	09	05	17	62	02
2.	3-year M.Sc. Tech (Applied Geophysics)	GP	22	07	03	12	44	01
3.	2-year M.Sc. (Physics)	PH	22	07	03	12	44	01
4.	2-year M.Sc. (Chemistry)	CH	31	09	05	17	62	02
5.	2-year M.Sc. (Mathematics & Computing)	AM	22	07	03	12	44	01
		Total	**128**	**39**	**19**	**70**	**256**	**07**

Besides, one seat each will be reserved for (i) J & K Migrants (JK), (ii) Wards of Defense Personnel (DP), (iii) Parsi (PS) applicants in various M.Sc./ M.Sc. Tech. programmes. Seats reserved for PD (Physically challenged) /DP/PS applicants are inclusive within their respective categories. Seat for J&K Migrants and other reservation, if any, as per Govt. of India is supernumerary.

PART III

INSTRUCTIONS FOR FILLING ONLINE APPLICATION

A. GENERAL INSTRUCTIONS
1. All enclosed material must be on A4 paper size only.
2. If any applicant fails to send the requisite documents, his /her application will be rejected due to incomplete information.
3. Avoid any cutting or overwriting on the copies of certificates.

CATEGORY ABBREVIATIONS
GE -	GENERAL	SC -	SCHEDULED CASTE
OB -	OTHER BACKWARD CLASS	ST -	SCHEDULED TRIBE

SUB-CATEGORY ABBREVIATIONS
PD -	PHYSICALLY CHALLENGED	JK -	JAMMU & KASHMIR MIGRANTS
DP -	WARD OF DEFENCE PERSONNEL	PS -	PARSI

B. GUIDELINES FOR FILLING UP THE APPLICATION FORM
3.1 Payment option: Through Online payment (Net Banking/ Debit Card / Credit Card). The application fee for SC/ST/PD category is ₹ 1000/- and ₹ 2,000/- for rest of the categories. **FEE ONCE PAID IS NON REFUNDABLE**.

3.2 Photograph: Upload your recent passport size **full face colour** photograph of maximum size 50Kb in the Online Application.

3.3 Signature: Upload your scanned signature maximum size 20Kb in the Online Application.

3.4 Name: Enter your full name in Capital letters.

3.5 Address/Telephone No./Email ID
a) Address for correspondence: Write the complete postal address in capital letters and PIN code to which communications are to be sent.
b) Permanent address : Enter your permanent home address in capital letters and PIN code.
c) Telephone/Mobile Number : Enter your working Mobile and landline telephone numbers with STD code of your parents and yourself.
d) Email address : Enter your valid email ID.

3.6 Date of Birth: Enter your date of Birth according to English Calendar as per record in the Secondary Education Board/ University certificate.

3.7 Sex: Select appropriate option.

3.8 Nationality: Enter your nationality.

3.9 Category/Sub-Category: Select appropriate category code and subcategory code (if applicable). Applicants must enclose attested copies of appropriate certificates, viz., caste certificate for OBC/SC/ ST from the **concerned District Officer;** medical certificate for PD (Physically Challenged) from **Civil Surgeon;** certificate of being a ward of Defence Personnel (DP) from the **respective record office/ Army Headquarters (Adjutant General's Branch)**; and certificate from **concerned District officer** for being a Parsi (PS) / JK migrants with the receipt of online application.

OBC Applicants should attach an attested photocopy of valid and recent OBC (Non Creamy Layer) certificate in <u>Govt. of India format only</u> from competent authority which should not be older than six months from the last date of submission (18th April 2016) of applications, i.e. the OBC (NCL) certificate must be issued on or after 18th October 2015. Otherwise the applicant will not get the benefit of OBC-NCL category. The selected candidates without valid OBC-NCL certificate in Govt. of India format will be denied admission. <u>No undertaking will be allowed in this regard.</u>

3.10 Course applied: Applicants should select appropriate course and subject of Entrance Examination.

3.11 Choice of Examination Centres : From the list of examination centres, select the names of any three convenient, different centres in the order of preference. In case sufficient number of applicants is not available at any centre, I.S.M. may allot any other centre. ALLOTMENT OF CENTRE IS AT THE **SOLE DISCRETION** OF I.S.M. REQUEST FOR **CHANGE OF EXAMINATION CENTRE WILL NOT BE ENTERTAINED**. ISM may cancel any center of examination.

3.12 Educational Qualification: Write the details of all examinations passed/ appeared/ appearing. Write name of the college and the name of the University affiliation in appropriate columns. Mention the year of examination passed / appeared/ appearing and the subjects of examination in respect of **ALL THE YEARS/SEMESTERS**.

3.13 Name of father and mother: Write name of your (a) father, and (b) mother.

3.14 Declaration by Applicant: Write your full name in capital letters and upload the scanned signature (20Kb size) in the space provided in the online application form. Also, the candidate has to put his/her original signature in the system generated Application Form and mention place and date while sending the system generated Application Form.

3.15 Rejection: System Generated Applications along with all relevant documents received after **18th April 2016,** will be summarily rejected. Furnishing any false information may result in rejection of application at any stage.

C. Attachments (to upload with online application during registration).

1. Self attested scanned copy of 10th class certificate or appropriate certificate as a proof for the **date of birth.**
2. Self attested scanned copy of **both sides** of **ALL** mark-sheets of each **passed** / **cleared** years of 3- year B.Sc./ 4- year B. Sc. B. Ed. programme (for M.Sc/M.Sc **Tech.)**
3. Self attested scanned copy **of th**e r**equisit**e CATEGORY certificate, i.e., OBC/SC/ST and SUB-CETEGORY, i.e., PD/DP/JK/PS, if the applicant belongs to any of these categories.
4. Scanned copy of online payment receipt.

D. CHECK LIST

(i) Candidates must ensure eligibility criteria such as minimum qualification, subject combination, Date of Birth/Age, reservation status [for OBC (NCL), only Govt. of India format is accepted].
(ii) Whether correct name of the course and subject of examination is mentioned?
(iii) Whether you have uploaded recent passport size **full face colour** photograph of appropriate size in the online application?
(iv) Whether you have uploaded your scanned signature (should be clear and legible)?
(v) Whether all the entries in the Application Form are filled and no item is left blank?

SYLLABUS FOR M. Sc. /M. Sc. Tech. ENTRANCE EXAMINATION, 2016

4.1. <u>GEOLOGY</u> - for 3-year M. Sc. Tech. (Applied Geology) course

A. **GENERAL GEOLOGY:** Age, origin and interior of the earth; formation of continents, and oceans; geological time-scale; physiographic features of India. Processes of weathering, erosion, transportation and deposition. Geological work of running water (river), lake, glaciers, sea, wind, groundwater and organic life. Mountains, plateaus and plains. Volcanoes and earthquakes. Elementary ideas on plate tectonics.

B. **MINERALOGY:** Classification of minerals, and physical and chemical properties of important minerals. Double refraction, pleochroism, birefringence, interference figures, sign determination of uniaxial and biaxial minerals, optic axial angle. Diagnostic optical properties of important rock-forming minerals.

C. **CRYSTALLOGRAPHY:** Classification of crystal classes and crystal system, twinning, isomorphism, pseudomorphism and polymorphism.

D. **PETROLOGY:** Crystallisation, differentiation and assimilation of magma. Bowen's Reaction Series. Processes of sedimentation and sedimentary structures. Types of metamorphism, metamorphic grades and facies. Classification, mode of occurrence, texture, structure and mineral composition of common igneous, sedimentary and metamorphic rocks.

E. **STRCUTURAL GEOLOGY:** Common structural features of rock masses. Stratification, joint, cleavage, schistosity and lineation; dip, strike, and thickness of beds. Effect of topography on outcrop of beds. Folds, faults and unconformities: their classification, description and recognition in field and on the geological maps.

F. **ECONOMIC GEOLOGY:** Forms, mode of occurrences and classification of mineral deposits. Important processes of formation of economic mineral deposits. Some common and important metallic and non-metallic mineral deposits of India with particular reference to their geology, geographical occurrences and utilisation. Geology of fuels.

G. **STRATIGRAPHY:** Standard stratigraphical scale and its subdivisions. Principles of stratigraphy. Major geological formations of India with special reference to Archaean, Proterozoic, Palaeozoic, Mesozoic and Tertiary stratigraphy.

H. **PALAEONTOLOGY:** Fossils – definition, nature and mode of preservation. General description of most common fossil groups of invertebrates and plants. Stratigraphic distribution and evolutionary trends of common invertebrate phyla.

4.2. <u>PHYSICS</u>- for 2-year M. Sc. (Physics) and 3-year M. Sc. Tech. (Applied Geophysics) courses

A. **GENERAL PHYSICS:** Linear and angular motion of particles. Newton's Gravitational law, gravitational field due to geometrical bodies. Kepler's law, escape velocities and satellites. Rotational motion, Moment of inertia for various geometrical bodies, Elastic modulii and their inter-relations, torque on cylinder, cantilever, ripples and gravity waves, Molecular theory of surface tension, Capillarity for liquid columns, Kinematics of moving fluids, equation of continuity, Euler's equation, Bernaulli's theorem, viscosity, Stokes law.

B. **SOUND:** Simple harmonic motion and its superposition, Velocity of sound waves. Dispersion and phase and group velocity of waves. Free, damped, forced vibrations. Fourier's theorem and its applications, analyzing simple waveforms, concept of vibration of membrane, vibration of air column, vibrations of strings, acoustics of auditorium and building.

C. **CLASSICAL MECHANICS:** Hamilton's principle, Lagrange's and Hamilton's equations of motion, Motion in a central field, inertia of ellipsoid and principal moments of inertia, moment of rigid body, Euler's equation of rotating body, gyroscopic motion.

D. **SPECIAL THEORY OF RELATIVITY:** Inertial frames and Galilean invariance, Postulates, Lorentz transformation and consequences, length contraction and time dilation, Velocity dependence of mass. Relativistic velocity addition theorem. Mass energy equivalence.

E. **STATISTICAL PHYSICS:** Distinguishable and indistinguishable particle, Maxwell-Boltzman, Fermi-Dirac and Bose-Einstein distribution laws. Black body radiation: Planck's radiation law-Wein's and Raleigh-Jean's distribution laws and Stefan's law.

F. **THERMAL PHYSICS:** Kinetic theory of gases. Laws of Thermodynamics, Isothermal and adiabatic processes. Reversible, irreversible and quasi-static processes, Carnot's cycle, Entropy, Maxwell's and T-dS equations. Phase transition and Clausius- Clapeyron's equations, Latent heat equations for liquid and vapour. Liquification of gas, Vander-Waal's equation, Joule-Thomson effect, Enthalpy, Free energy.

G. OPTICS: Combination of thin lenses and thick lens, Rayleigh's criterion and resolving powers. Interference of light, Diffraction of light, Plane and concave gratings. Double refraction, Plane, circular and elliptical polarizations. Dispersion through prisms and grating. Zeeman effect, Stark effect; rotation and vibration spectra of molecules.

H. ELECTRICITY/MAGNETISM: Gauss's law, system of charges, conductors, capacitors, dielectrics, dielectric polarization, volume and surface charges, electrostatic energy, Bio-savart's law, Ampere's law, Faraday's law of electromagnetic induction, self and mutual inductance, electric polarization and displacement, electric images, space-quantization, Stern-Gerlach experiment. Langevin's theories of dia- and para- magnetism. Weiss' theory of ferromagnetism, hysteresis, transients, L.C.R. circuit, alternating current, use of J-operator in solving electrical circuit problems, parallel and series-resonant circuits, transformers. Seebeck, Peltier, and Thomson effects, Poisson's and Laplace's equations. Maxwell's field equations, plane electromagnetic waves, Poynting's theorem, reflection and refraction at dielectric interface.

I. MODERN PHYSICS: Nuclear disintegration, mass defect, packing fraction, binding energy, nuclear energy, elementary crystallography, crystal binding, Einstein's and Debye's theories of specific heat, free electron in metals. Fermi energy and density of states. Elementary band theory. Concept of hole & effective mass, Photoelectric, Compton and Raman effects. Active semiconductor devices- diodes and transistors, rectifier, simple voltage amplifier, principle of oscillator. Radio-activity, α and β spectra; theories of α and β decay.

4.3. CHEMISTRY- for 2-year M. Sc. (Chemistry) course

A. PHYSICAL CHEMISTRY:

Atomic structure: Fundamental particles, Bohr's theory of hydrogen atom; wave particle duality; uncertainty principle; Schrödinger's wave equation; quantum numbers, shapes of orbitals, Hund's rule and Pauli's exclusion principle.

Theory of gases: Kinetic theory of gases, Maxwall Boltzmann distribution law, Equipartition of energy.

Chemical thermodynamics: Reversible and irreversible processes; First law and its application to ideal and nonideal gases; Thermo chemistry; Second law; Entropy and free energy, criteria for spontaneity.

Chemical and Phase Equlibria: Law of mass action; K_p, K_c; Effect of temperature on K; Ionic equlibria in solutions; pH and buffer solutions, hydrolysis; solubility product. Phase equlibria – phase rule and its application to one component and two-component systems, Colligative properties.

Electrochemistry: Conductance and its application; transport number, Galvanic cells, EMF and Free energy; Concentration cell with and without transport.

Chemical Kinetics: Reactions of different order, Arrhenius equations, and Collision theory, Theory of absolute reaction rate; Chain reactions-Normal and branched chain reactions

B. ORGANIC CHEMISTRY:

Basic concepts in organic chemistry and stereochemistry: Isomerism and nomenclature, electronic (resonance and inductive) effects. Optical isomerism in compounds containing one and two asymmetric centers, designation of absolute configuration, conformations of cyclohexanes.

Aromaticity & Huckel's rule: Mono & bicyclic aromatic hydrocarbons.

Organic reactions mechanism and synthetic applications: Methods of preparation and reactions of alkanes, alkenes, alkynes, arenes and their simple functional derivatives, Mechanism and synthetic applications of electrophilic aromatic substitution. Stereochemistry and mechanism of aliphatic nucleophilic substitution and elimination reactions. Mechanism of aldol condensation, Claisen condensation, esterification and ester hydrolysis, Cannizzaro reaction, benzoin condensation, Perkin reaction, Claisen rearrangement, Beckmann rearrangement and Wagner-Meerwein rearrangement. Synthesis of simple molecules using standard reactions of organic chemistry. Grignard reagents.

Natural Products chemistry: Introduction to the various classes of compounds-alkaloids, terpenes, carbohydrates, amino acids and nucleic acids.

Qualitative Organic analysis: Functional group interconversions, identification of functional groups by chemical tests.

C. INORGANIC CHEMISTRY:

Periodic table: Periodic classification of elements and periodicity in properties; general methods of isolation and purification of elements.

Chemical Bonding and Shapes of compounds: Types of bonding; VSEPR theory and shapes of molecules; hybridization; dipole moment; ionic solids; structure of NaCl, CsCl, diamond and graphite; lattice energy.

Main group Elements (s- and p- blocks): Group relationship and gradation in properties; structure of electron deficient compounds of main group elements and their applications.

Transition metals (d-block): Characteristics of 3d elements; oxides, hydroxides and salts of first row metals; coordination complexes; VB and crystal field theories for structure, colour and magnetic properties of metal complexes.

D. ANALYTICAL CHEMISTRY:

Principles of qualitative and quantitative analysis; acid –base, oxidation-reduction and precipitation reactions, use of indicators, radioactivity; nuclear reactions; applications of isotopes.

4.4. MATHEMATICS- for 2-year M. Sc. (Mathematics & Computing) course

A. **DIFFERENTIAL CALCULUS:** Successive differentiation. Leibnitz's theorem, Taylor's and Mclaurin's series of one and two variables, partial and total derivatives, maxima and minima of function of one, two and three variables, curvature and asymptotes.

B. **INTEGRAL CALCULUS:** Definite integral, differentiation under integral sign. Improper Integrals, Beta, Gamma and error functions, double and triple integrals and their applications. Reimann-integration: necessary and sufficient conditions, Reimann Stieltjes integral as a generalization of Reimann integration, necessary and sufficient conditions for R-S integrability.

C. **VECTOR CALCULUS:** Differentiation of scalar and vector point functions, Expansion formulae involving gradient, divergence and curl, line, surface and volume integration of vector function, Green's, Gauss and Stoke's theorems and their applications. Orthogonal curvilinear coordinates.

D. **ALGEBRA:** Convergence of series, Cauchy's general principle of convergence, convergence of series of non-negative terms, comparison, Cauchy's root, condensation, D' Alembert's, Raabe's, De-Morgan and Bertrand, and logarithmic tests of convergence. Alternating series, conditional and absolute convergence, Power series. Solution of cubic and biquadratic equations.

E. **ABSTRACT ALGEBRA:** Group: properties, abelian group, cyclic group, permutation group, order of an element of group, subgroups of a group and their properties. Normal subgroup, quotient group. Elementary ideas of a ring, integer domain and field and their properties.

F. **BOOLEAN ALGEBRA:** Properties and relation in Boolean algebra, Application of Boolean algebra in electrical networks, solvability of Boolean equations and logical puzzles.

G. **MATRIX ALGEBRA:** Rank and Inverse of a matrix, normal form of matrix, consistency conditions, solution of system of linear equations, linear and orthogonal transformations, eigen values and eigen vectors, Caley-Hamilton theorem, reduction to diagonal form and reduction of quadratic form to canonical form. Orthogonal, unitary and Hermitian matrices and their eigen values. Vector space and properties.

H. **COMPLEX VARIABLES:** Analytic functions, Cauchy-Reimann equations, harmonic functions, complex integration, Cauchy's theorem, Cauchy's integral formula. Expansion of analytic functions in power series-Taylor's and Laurent's series, residues, evaluation of integral using residue theorem.

I. **DIFFERENTIAL EQUATIONS:** Formation of differential equations, solution of first order and higher order differential equations with constant and variable coefficients. Simultaneous linear differential equations. Partial differential equations of first order. Application of differential equations.

J. **DYNAMICS:** Motion in two dimensions: Velocity and acceleration parallel to coordinate axes, radial and transverse velocities and acceleration, tangential and normal velocities and acceleration, D' Alembert's principle.

K. **LAPLACE TRANSFORMS:** Laplace transform of some elementary functions, properties, Laplace transforms of derivatives, Laplace transform of integrals, t-multiplication and t-division theorems, inverse Laplace transform, convolution theorem, applications.

L. **NUMERICAL METHODS:** Finite difference, Interpolation in regular or irregular intervals, numerical differentiation and integration, numerical solution of first order ordinary differential equation, solution of non-linear equations, solution of simultaneous linear equations by Gaussian methods and method of factorization.

M. **STATISTICS:** Probability of events, mutually exclusive and independent events, Baye's theorem, probability mass and density functions, binomial, Poisson and normal distributions.

PART V

MEDICAL FITNESS STANDARDS

5.1 For GE/ OB/SC/ ST/ DP/ JK/PS Applicants:

Applicants must satisfy the following minimum medical standard of fitness at the time of admission, if selected.

1. Height: 1.5 m and weight: 41 kg.
2. Chest measurement: 69 cm. and Expansion: 5 cm.
3. Heart and Lungs: No abnormality. Open heart surgery cases will be rejected.
4. Hernia, Hydrocele, Piles, etc: Temporary disqualification to be rectified before joining.
5. Vision: corrected to 6/6 in both eyes. However, glass power should be within (-3.5). Eyes free from disease.

Colour Blind applicants are Not Eligible for admission in M. Sc. Tech (Applied Geology) and M. Sc. Tech (Applied

Geophysics)

6. Limbs: Should not have any defect, *viz.* Poliomyelitis, paralysis, paresis, amputation.
7. Stammering: Mild degree only allowed.
8. Hearing: Should be normal. Hearing aid cases will be rejected.
9. Kidneys: Operated cases (transplant) will be rejected.
10. Congenital defects like Cryptorchidism should join after operative treatment.
11. Applicant should not suffer from Tuberculosis, Pleurisy, Asthma, Rheumatic fever, Heart disease, E.N.T. disorder, Gastric/Ulcer/Kidney/Diabetes, Polio-myelitis or Neurological diseases, Epilepsy, psychiatric disease, and major operation leading to disability.

5.2 For PD (Physically Challenged) applicants:

Medical Standard of fitness and Medical Examination Report from **Civil Surgeon** for PD (**Physically Challenged**) applicants will be as per the Government of India norms.

MEDICAL EXAMINATION REPORT
(For GE/ OB/SC/ ST/DP/JK/PS Candidates)

(To be issued by a Registered Medical Practitioner and **submitted at the time of admission by selected candidates**. Please refer to Part V: **MEDICAL FITNESS STANDARD for GE/ OB/SC/ ST/DP/ JK/PS Candidates.** The selected candidates will be examined further by a Medical Board arranged by I.S.M. **at the time of admission**)

MEDICAL FITNESS STANDARD PERSONAL HISTORY

(Items 1 to 7 are to be filled by the Candidate)

1. Name : _____

2. Roll No : _____

3. Parent/Guardian's Name : _____

4. Age : Year : _____ Months. _____   5. Sex : Male/ Female

6. Identification Mark on the Body : (This can be mole, scar or birth mark) _____

7. Major illness/Operation : (Specify nature of illness/Operation) _____

MEDICAL CERTIFICATE

(Items 8 to 19 are to be filled by Medical Officer conducting the medical examination. Please refer to **Part V**

for the **Medical fitness standards**)

8. Height _____ cm.   9. Weight _____ kg.   10. Chest (a) Inspiration _____ cm (b) Expiration _____ cm

11. Respiratory System _____   12. Hearing _____   13. Nervous System_____

14. Past History   (a) Mental Disease _____   (b) Epileptic fit _____

15. Vision with or without glass (a) Right Eye _____ (b) Left Eye _____ (c) Colour Blindness* _____

16. Abdomen (a) Liver _____   (b) Spleen _____

17. Heart   (a) Sounds _____   (b) Murmur _____

18. (a) Hernia _____   (b) Hydrocele _____

19. Any other defects detected _____

   Certified that Mr./Ms _____

   Son / Daughter of _____

   (a) fulfils the prescribed standard of physical fitness and is FIT for admission to M. Sc. / M. Sc. Techprogramme

   (b) does not fulfill the prescribed standard of physical fitness

   (c) is unfit/temporarily unfit for admission due to following defects _____

--   --
Signature of the Candidate with date   Signature of the Medical Officer with date

                                                     Full Name _____

                                                     Registration No. -----------------------------------

Official Seal of the Medical Officer

[*Candidates with **Colour blindness** are **NOT ELIGIBLE** for admission **M. Sc. Tech (Applied Geology) and M. Sc. Tech (Applied Geophysics)**]

Performa for Other Backward Class (Non-Creamy Layer) Certificate

(CERTIFICATE TO BE PRODUCED BY OTHER BACKWARD CLASSES APPLYING FOR ADMISSIONS TO CENTRAL EDUCATIONAL INSTITUTIONS (CEIs), UNDER THE GOVERNMENT OF INDIA)

This is to certify that Shri/Smt./Kum. _____ Son/Daughter of Shri/Smt. _____ of Village/Town _____ District/Division _____ in the _____ State belongs to the _____ Community which is recognized as a backward class under:

(i) Resolution No. 12011/68/93-BCC(C) dated 10/09/93 published in the Gazette of India Extraordinary Part I Section I No. 186 dated 13/09/93.

(ii) Resolution No. 12011/9/94-BCC dated 19/10/94 published in the Gazette of India Extraordinary Part I Section I No. 163 dated 20/10/94.

(iii) Resolution No. 12011/7/95-BCC dated 24/05/95 published in the Gazette of India Extraordinary Part I Section I No. 88 dated 25/05/95.

(iv) Resolution No. 12011/96/94-BCC dated 9/03/96.

(v) Resolution No. 12011/44/96-BCC dated 6/12/96 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 11/12/96.

(vi) Resolution No. 12011/13/97-BCC dated 03/12/97.

(vii) Resolution No. 12011/99/94-BCC dated 11/12/97.

(viii) Resolution No. 12011/68/98-BCC dated 27/10/99.

(ix) Resolution No. 12011/88/98-BCC dated 6/12/99 published in the Gazette of India Extraordinary Part I Section I No. 270 dated 06/12/99.

(x) Resolution No. 12011/36/99-BCC dated 04/04/2000 published in the Gazette of India Extraordinary Part I Section I No. 71 dated 04/04/2000.

(xi) Resolution No. 12011/44/99-BCC dated 21/09/2000 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 21/09/2000.

(xii) Resolution No. 12015/9/2000-BCC dated 06/09/2001.

(xiii) Resolution No. 12011/1/2001-BCC dated 19/06/2003.

(xiv) Resolution No. 12011/4/2002-BCC dated 13/01/2004.

(xv) Resolution No. 12011/9/2004-BCC dated 16/01/2006 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 16/01/2006.

(xvi) Resolution No. 12011/14/2004-BCC dated 12/03/2007 published in the Gazette of India Extraordinary Part I Section I No. 67 dated 12/03/2007.

(xvii) Resolution No. 12015/2/2007-BCC dated 18/08/2010.

(xviii) Resolution No. 12015/13/2010-BCC dated 08/12/2011.

Shri/Smt./Kum. _____ and/or his family ordinarily reside(s) in the _____ District/Division of _____ State. This is also to certify that he/she **does not belong to the persons/sections (Creamy Layer)** mentioned in Column 3 of the Schedule to the Government of India, Department of Personnel & Training O.M. No. 36012/22/93-Estt. (SCT) dated 08/09/93, modified vide OM No. 36033/3/2004-Estt.(Res.) dated 09/03/2004, further modified vide OM No. 36033/3/2004-Estt. (Res.) dated 14/10/2008 or the latest notification of the Government of India.

This certificate is being issued based on the annual income / status of the parents / guardian of the applicant as on financial year ending 31st March, 2015.

Dated: District Magistrate/Deputy Commissioner
Seal   Competent Authority

NOTE:
(a) The term 'Ordinarily' used here will have the same meaning as in Section 20 of the Representation of the People Act, 1950.
(b) The authorities competent to issue Caste Certificates are indicated below:
  (i) District Magistrate / Additional Magistrate / Collector / Deputy Commissioner / Additional Deputy Commissioner / Deputy Collector / Ist Class Stipendiary Magistrate / Sub-Divisional Magistrate / Taluka Magistrate / Executive Magistrate / Extra Assistant Commissioner (not below the rank of 1st Class Stipendiary Magistrate).
  (ii) Chief Presidency Magistrate / Additional Chief Presidency Magistrate / Presidency Magistrate.
  (iii) Revenue Officer not below the rank of Tehsildar and
  (iv) Sub-Divisional Officer of the area where the candidate and / or his/her family resides.