NEE-2019

INFORMATION BROCHURE

NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE & TECHNOLOGY
(UNDER THE MINISTRY OF HUMAN RESOURCE DEVELOPMENT, GOVT. OF INDIA)
DEEMED TO BE UNIVERSITY, U/S 3 OF THE UGC ACT, 1956
NIRJULI (ITANAGAR), ARUNACHAL PRADESH – 791 109

1. ABOUT THE INSTITUTE

The North Eastern Regional Institute of Science and Technology (NERIST) is a unique Institute in the country, having unconventional and innovative academic programmes. It was established in the year 1983 by the Government of India. Its foundation stone was laid by the former President of India Late GyaniZail Singh on 4th March, 1984.

The Institute was set up initially as a project of the North Eastern Council (NEC) for providing a system of education to create technical manpower at various levels for the development of the North Eastern Region of the country. Its approach is to encourage a policy of vocationalisation at the 10+2 level and to allow motivated of students to move up for professional degree while others to go out of the Institute to enrich their profession with industrial experience. It is autonomous and fully funded by the Ministry of Human Resource Development (MHRD), Govt. of India since April 1, 1994. It got the status of a DEEMED UNIVERSITY on 31st May 2005 under section 3 of the UGC Act 1956. It is governed by the Board of Management (BoM) comprising representatives of the MHRD, Govt. of India, the eight beneficiary states of the North East India, AICTE and eminent educationists. It is residential, and is spread over 513 acres of land.

Academic programmes in the Institute started during August 1986 with the first batch of students admitted to the Base Module. Till July 2018, twenty-seven batches of students in Agricultural Engineering, Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Electrical Engineering, Mechanical Engineering and Forestry have graduated and many have been placed in reputed organizations at national and international levels. Full-fledged PG and Ph.D. programmes started during 2007.

2. LOCATION

The Institute is located in a picturesque valley at the foot-hills of the Eastern Himalayas, and is situated at Nirjuli (Itanagar) in Papum Pare district of Arunachal Pradesh on National Highway 415. It is about 360 kms from Guwahati (Assam) and 10 kms from Banderdewa, the Entry Gate to the capital complex, Itanagar (Arunachal Pradesh). From the Institute, the capital town, Itanagar is about 20 kms. onward.

Arunachal Pradesh being the land of exotic orchids and lush green hills, it provides an ideal setting for a seat of technical institution in the backdrop of quiet and pristine surroundings. The Institute can be accessed by rail and road from Guwahati to Naharlagunrailway stations. The nearest airports are located at Guwahati, Tezpur and Lilabari (North Lakhimpur) respectively. Super Deluxe buses daily to and from Guwahati. Taxis can also be hired at Guwahati to reach the Institute.

3. OBJECTIVES

- To develop human resources at three levels, i.e., Technician, Supervisory and Executive levels for the development of the North Eastern region in particular and the country in general;
- To impart quality education with flexible multi-entry/exit systems to cater to the needs of the region;
- To develop entrepreneurship base in the region;
- To facilitate competency building in the North Eastern Region;
- To strengthen R & D activities in the region; and
- To play an advisory role for the overall development of the North Eastern Region.

4. TEACHING DEPARTMENTS

There is12(**Twelve**)degree awarding departments including a Center for Management Studies. The Institute offers bachelor's degree programmes in 6(six) engineering disciplines and one in Forestry. The engineering disciplines are Agricultural Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics and Communication Engineering, and Mechanical Engineering. Besides the bachelor's degree programmes, several post-graduate degree programmes leading to M.Tech, M.Sc, MBA and PhD are also offered by the Institute.

5. THE FACULTY

Highly qualified and motivated faculty members from premier Institutes of the Country led by eminent Directors, have helped the Institute to grow into a vibrant seat of higher education catering to the needs of the Industries. The faculty members are PhDs / Post-Graduates from the universities abroad, IIT's, IISc, Central Universities, NITs and other leading Institutions of the country, and they have published good number of research papers in international / national journals of repute. Some of them have received awards for their contributions in research and academics. Many faculty members are engaged in sponsored research projects funded by CSIR, DST, DoE, UGC, AICTE, ICAR, DBT, DIT, TERI, IIRS, UNDP, ISRO, NBHM, MoEF, etc. A number of faculty members have visited abroad on prestigious fellowships such as BOYSCAST Fellowship, INSA Nehru Centenary Fellowship, SERC Fellowship, etc.

6. ACADEMIC STRUCTURE

Technology stream (i.e., Engineering branches) at NERIST consists of three independent modules, viz., Base (Certificate), Diploma, and Degree modules. The first entry is at the Base Module after Class X through NEE-I. Lateral entry or lateral admission into Diploma and Degree modules are permitted through NEE-II and NEE-III respectively. Normal duration of each module is two years (i.e., four Semesters). Duration for lateral entry students admitted to degree module through NEE-III is three years. The modular system of academic structure provides terminality corresponding to an occupational level, and at the same time, it allows entry to the next higher module leading finally to a degree in engineering and technology in six years' time after class X.

The Base and Diploma levels emphasize more on practical aspects of engineering which go a long way in helping an individual to become an entrepreneur or face day-to-day problems of industry. The degree curriculum provides instructions in engineering analysis and also emphasizes on management and entrepreneurship aspects making an individual more suited to the needs of today's industries.

Forestry stream, on the other hand, has entry point after 10+2 with Physics, Chemistry and Biology through NEE-II for admission to Degree Module leading to B.Sc degree in Forestry of four years' duration (eight Semesters).

7. CENTRAL FACILITIES

7.1 ADVANCED CENTRAL COMPUTING FACILITY (ACCF)

ACCF was established in 1996 with the objective of promoting research by faculty members and encouraging advanced computer studies by students.

7.2 EDUCATIONAL TECHNOLOGY CELL

The ET cell was established as a project sponsored by the MHRD, Govt. of India with an objective to increase the effectiveness of teaching-learning process with the help of modern audio-visual equipment. Now, the cell consists of processing laboratory, seminar room, and board room that are well equipped with the state of the art audio-visual equipments. These are used for Seminars, Conferences, Workshops and special lectures by faculty members and professionals from institutions and industries. The cell provides internet facility through BSNL NKN connectivity of 1GBPS bandwidth to all the ddepartments, offices, hostels and the schools in the campus. The campus is fully wi-fi enabled.

7.3 INSTITUTE LIBRARY

The Institute library, with a collection of over 63431 text books and reference books in its Central library and over 35,000 books in Book Bank, subscribes 104 national and International journals. It also subscribes 14 magazines and 10 national and regional dailies to provide a base for enhanced learning. Every student can issue a full set of books from its Book Bank facility in each semester.

The library is also a member of MHRD INDEST Consortium, Govt. of India that offers access to 9 international e-resources. Besides this, it also subscribes JSTOR e-resources for the users of the Institute. It possesses IS code on CD-ROM and other educational DVDs. Being an institutional member of Indian Liquid Crystal Society, Bangalore and Kaziranga Wild Life Society of Assam, it receives literature and information services from them**.** Users can also access their required information about books through OPAC (On-line Public Access Catalogue).

7.4 CAMPUS AMENITIES

The Institute has a number of necessary infrastructural facilities such as Sub-Post Office, Branch of State Bank of India with core banking and ATM facilities, a departmental store, an Institute Canteen, a Medical Health Unit, Kendriya Vidyalaya and Kinder Garten School. ATM facilities have been extended by the SBI Bank and Canara Bank as well. There are recreational clubs for the faculty & officers, staff, and ladies. The Institute has a BSNL telephone exchange in its campus, and has its own EPABX of 1200 lines. For stationery items, stores are provided in boys' and girls' hostel compounds.

7.5 STUDENTS' ENROLMENT

The Institute currently has a strength of about 1860 students. It is residential and accommodates most of the students in its Ten Hostel blocks, ouof whichtwo are exclusively for the girl students. **However,students admitted through NEE-III will be provided hostel accommodation subject to the availability of seats in the NERIST hostels.**

7.6 STUDENT GYMKHANA

Students' Gymkhana is the centre of co-curricular activities for the students of the Institute. It provides the students with facilities for their all-round development in the field of sports, cultural activities, hobbies and creativity. One multi-gym, one indoor badminton court, three basketball courts and a playground are under the Gymkhana.

7.7 TRAINING AND PLACEMENT

Since its inception in 1991, the Training and Placement (T&P) Cell of the Institute provides training, placement and career development opportunities to its students, while simultaneously conducting Industry–Institute interactions, Public relations and awareness programmes, Entrepreneurship Development Programmes and Student Career Counseling.

Industrial Training programmes for the students being a compulsory requirement in partial fulfillment of the curriculum, the T&P Cell organizes such programmes for a period of 30-45 days at the end of the pre-final year during summer vacation. These trainings are conducted in reputed organizations such as IOC, OIL Ashok Leyland, ONGC, Gammon India Ltd, HPC, NIC, DRDO, NESAC, Damodar Valley Corporation, Power Grid Corporation of India Ltd., NBCC, L&T, CPWD, CIAE, ICAR, Mother Diary, RFRI, NEIST, Stock Holding Corporation of India, NEDFI, HCL, etc.

The Training & Placement Cell also imparts in-house training to the students through IIT, Bombay. The cell also organizes the visits of executives of leading Public and Private Sector companies like IBM, DELL, MindTree& Power Grid Corporation of India Ltd. etc., to the Institute, under Industry-Institute-Interaction programmes, to deliver lectures on career development and prospects of placement in their organizations to the students.

The T&P Cell is also instrumental in counselling the final year students in securing jobs in consonance with their knowledge and skills by organizing campus interviews and at the same time exploring various other avenues for their placements. It organizes workshops for the pre-final and final year students to provide sufficient exposure in areas pertaining to their recruitment and selection, and to facilitate their entry into leading and highly professional organizations. Some of the prominent organizations that conducted campus interviews in the Institute recently include Energy Infra Tech Limited, Star Cement, Wireless TT Info services Limited, WIPRO Technology, Tata Tele Services, ZaloniInc, Soma Enterprises, PRADAN, SRIJAN, Met Life India Insurance, Vedanta Aluminium Ltd, NHPC, Indian Army, Indian Navy, etc.

Apart from the companies stated above, the students of the Institute are also placed in other prestigious industries/organizations such as ABB (Asia Brown Boveri), APTECH Computer Education; AT&T, Bells Laboratory, Texas Instruments, Ericsson (USA), CDC, C–DOT, CMC Ltd, Crompton Greaves, Fujitsu Network Switching of America Inc., HCL-HP Ltd., Hero Cycles, Hewlett Packard (Hong Kong) Ltd., Hindustan Cables, Hindustan Paper Corporation, Indian Railways (through IES), Modi Olivetti, Motorola (India) Electronics Private Ltd., National Informatics Centre,

NIIT, Oil India Ltd., PCL, Philips India, Reliance Industries, Shipping Corporation of India, Siemens, Steel Authority of India Ltd., Tata Telecom, TCS, Videocon, Wipro Ltd, etc.

8. FEE STRUCTURE

Fee structure of NERIST is subject to change from time to time as per the Institute regulations. The tentative Institute fees are as follows:

<table>
<tr><th>Module</th><th>Semester</th><th>GE/OBC</th><th>SC/ST/PD</th><th>Module</th><th>Semester</th><th>GE/OBC</th><th>SC/ST/PD</th></tr>
<tr><td rowspan="3">Base (Technology)</td><td>1st Sem.</td><td>Rs.13,350/-</td><td>Rs. 13,070/-</td><td rowspan="3">Degree (Technology)</td><td>1st Sem.(Vertical)</td><td>Rs.7650/-</td><td>Rs.7,540/-</td></tr>
<tr><td>2nd Sem. onwards</td><td colspan="2">Rs. 4510/-</td><td>1st Sem.(Lateral)</td><td>Rs.15,660/-</td><td>Rs.15,370/-</td></tr>
<tr><td colspan="2">--------</td><td>2nd Sem. onwards</td><td colspan="2">Rs.5,010/-</td></tr>
<tr><td rowspan="3">Diploma (Technology)</td><td>1st Sem.(Vertical)</td><td>Rs.6810/-</td><td>Rs.6710/-</td><td rowspan="3">Degree (Forestry)</td><td rowspan="2">1stSem</td><td rowspan="2">Rs.15,660/-</td><td rowspan="2">Rs. 15,370/-</td></tr>
<tr><td>1st Sem.(Lateral)</td><td>Rs. 14,190/-</td><td>Rs.13,900/-</td></tr>
<tr><td>2nd Sem. onwards</td><td colspan="2">Rs.4710/-</td><td>2nd Sem. onwards</td><td colspan="2">Rs.5010/-</td></tr>
</table>

HOSTEL Fees: Besides the above fees , the hostellers are required to pay the following fees:

Caution Money - Rs.3000/- (50% refundable after completion of course),
Mess Advance – **For Boys Hostel**- Rs.14, 800/- per semester & For Girls Hostel – Rs 12,000/- per semester

9. STIPEND / SCHOLARSHIP

The SC/ST students of North Eastern states are generally provided with stipends by the concerned state and Central governments at varying rates. The North Eastern Council (NEC) also provides scholarship to the students of the region for their study at Diploma ,Degreeand higher levels. The continuance of stipend is subject to the following conditions:

(i) His/her maintenance of discipline in the Institute is consistently good and he/she is regular in the classes. Unauthorized absence from the Institute/Hostel is treated as a lapse of discipline.
(ii) Satisfactory progress in his/her studies.

10. ACADEMIC WORK SCHEDULE

Academic schedule of the Institute starts in July with first semester from July to December and second semester from January to May. The Institute remains open for five days in a week with Saturday and Sunday being off days. Regular classes are scheduled from 8 am to 5 pm with one hour flexible lunch break between 12 noon and 2 pm.

11. ATTENDANCE

All students are expected to attend classes regularly. Permission of the teacher or course coordinator concerned must be obtained for any unavoidable absence from the classes. A student should have a minimum of 75% attendance in the lecture / laboratory / workshop / drawing classes prescribed for each course failing which he/she is not evaluated. In extreme situations, a 10% relaxation in attendance is permitted on medical grounds.

12. EVALUATION PROCEDURE

The evaluation procedure for the theory component of each course consists of three components: (i) Teacher's evaluation (class tests, assignments and quizzes, etc.), (ii) Mid-Semester examination of two hours duration and (iii) End-

Semester examination of three hours duration. The practical components of the courses are evaluated on the basis of the performance in the practical classes, practical tests and viva voce.

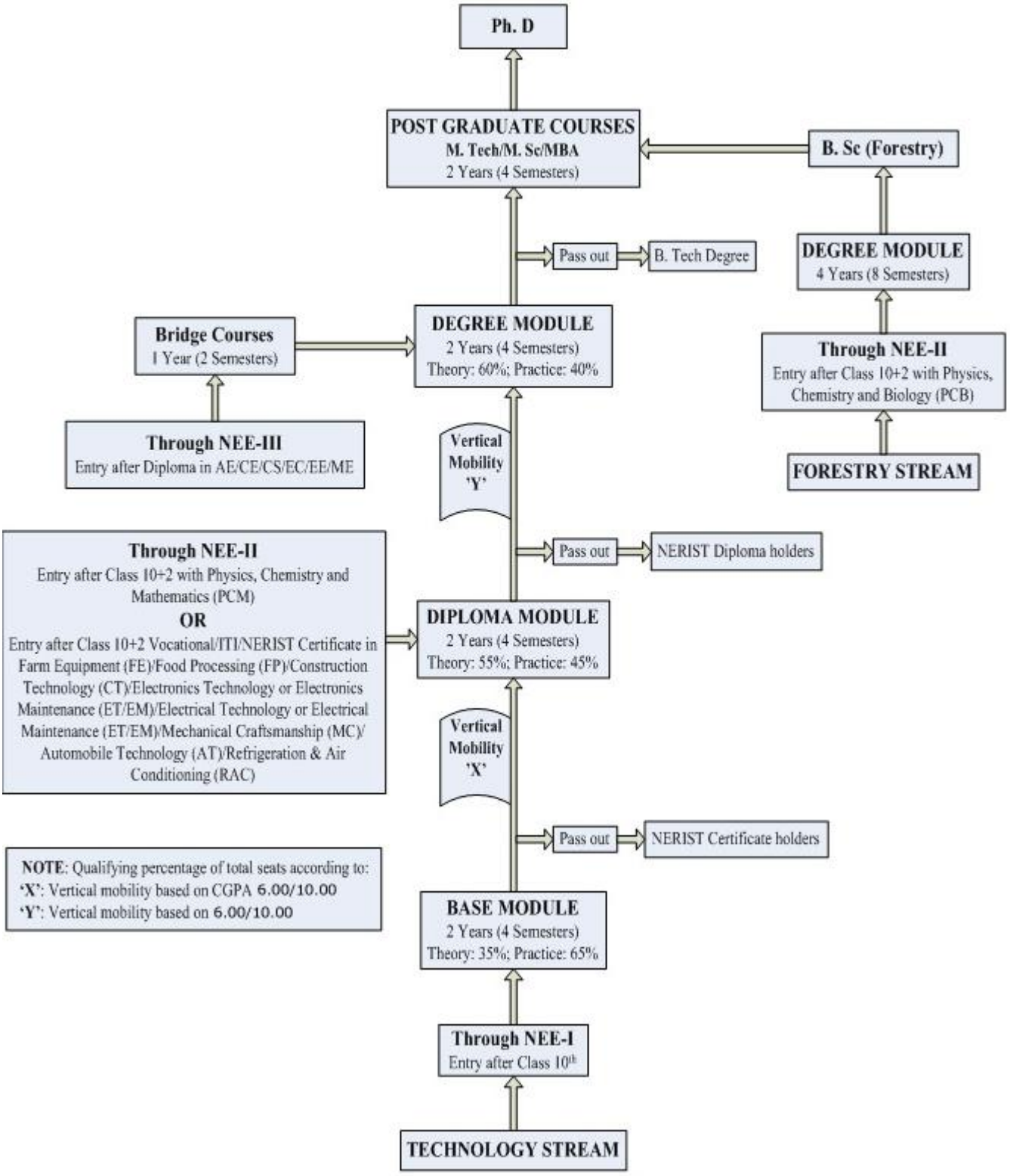
13. AWARDS

The most outstanding students of Base (Certificate), Diploma, Degree Modules are awarded gold medals at the time of convocation as per the norms of the Institute.

14. ADMISSION PROCEDURE

The NERIST Entrance Examination (NEE) is conducted at three Levels viz., NEE-I, NEE-II and NEE-III for admissions to Base Module, Diploma Module & Degree Module of Engineering & Technology branches of ***Technology stream***; and to Degree Module of ***Forestry stream*** through NEE-II (PCB). The entrance examination is conducted at various centers located in the States of Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim, Tripura. The selection of candidates is done in order of merit as per the institute regulations under various reservation categories of the respective states and the Union of India. The notification for NEE-I, II & III is published in national newspapers and regional newspapers of the North Eastern Region in the month of December /January every year. Information about the admission procedure can also be accessed by logging on to **http://www.neeonline.ac.in or http://www.nerist.ac.in**

ACADEMIC STRUCTURE



15. NERIST ENTRANCE EXAMINATION

The NERIST Entrance Examination (NEE) is conducted for admission in different modules of study in the Institute. Three different examinations, known as NEE-I, NEE-II and NEE-III, are conducted every year to admit students in different modules viz., Base (Certificate), Diploma and Degree modules of Technology Stream and 4 years Degree in Forestry.

For all the examinations (NEE-I/ NEE-II/ NEE-III) with any paper code, the *questions are of objective type with multiple-choice answers. Candidates shall have to attempt all the questions in all the sections of the relevant paper. For every wrong answer to a question, 25% (¼th) of the marks carried by that question is deducted. There is no deduction of marks for un-attempted questions.*

For all the examinations (NEE-I/ NEE-II/ NEE-III) with any paper code, *applicants who are appearing in the respective qualifying examination and whose results are awaited may also appear in the respective Entrance Examination. In such cases, selected candidates* ***must produce the original pass certificates and/or mark-sheets/grade cards at the time of their counseling for admission. Otherwise, their selection shall stand automatically cancelled.***

In case, an applicant is found ineligible at a later date (i.e., even after his/her admission is complete), his/her admission shall stand cancelled. Hence, all admissions shall be ***provisional and*** *subject to verification of facts from the original certificates/documents of the applicants.*

15.1 NEE-I (Paper Code 10) : It is conducted with a single question paper of 150 marks of three hours duration consisting of three sections viz. Section A (Physics), Section B (Chemistry) and Section C (Mathematics). Candidates appearing in NEE-I (Paper Code 10) are eligible for admission to Base (Certificate) Module of Technology Stream.

Examination Scheme for NEE-I

There is only one scheme of examination for all candidates appearing in NEE-I.

ELIGIBILITY FOR NEE-I

Maximum Age Limits as on **31st July, 2019** are 19 years for the students of the general category(GE) (**born on or after 1st August, 2000**), 22 years for OBC and female applicants (**born on or after 1st August, 1997**) and 24 years for ST/SC/PD (born on or after **1st August, 1995**).

Academic Qualification : Applicants must have passed Class X / Matriculation / Secondary examination or an equivalent examination with Science and Mathematics. They should have passed in all the subjects including Science and Mathematics separately.

Details of eligibility criteria, examination scheme and paper code are given in **Table – I**.

15.2 NEE-II (Paper Codes 20 to 29) : The NEE-II is conducted with a single question paper of 150 marks of three hours duration. The examination paper consists of either three or four sections with details given below.

Examination Scheme for NEE-II

There are three different examination schemes/ modes of question papers :

(i) NEE-II (PCM): Candidates, seeking admission in Diploma Module of **Technology Stream,** with academic qualification of 10+2 with Physics, Chemistry and Mathematics shall have to attempt **NEE-II (PCM).** Question paper under this scheme consists of three sections viz. Section A (Physics), Section B (Chemistry) and Section C (Mathematics).***Paper code for this scheme is 20.***

(ii) NEE-II (Vocational): Candidates, seeking admission in Diploma Module of **Technology Stream,** with academic qualification of 10+2(Vocational)/ITI/NERIST Certificate in any trade shall have to attempt **NEE-II (Vocational).** Question paper under this scheme consists of four sections viz. Section A (Physics), Section B (Chemistry), Section C (Mathematics) and Section D (Vocational Subject).

Important Notes:

i. There will be **two** sub-sections in Section D, i.e., D (a): Common Engineering Sciences, and D (b): Engineering Trade/Subject.
ii. Sections **A**, **B**, **C**, and Section **D (a)** are **compulsory for all**.
iii. **Section D (a)** of the question paper will contain 10 questions of 1-mark each & 5 questions of 2-marks each from syllabus of the **Common Engineering Sciences**.
iv. **Candidates have to select only ONE of the Engineering Trade, as per the choice given in the Admit Card, out of total Eight Engineering Trades** (Codes 21 to 28: Details given in Table – I).
v. **Section D (b)** will contain 20 questions of 1-mark each & 15 questions of 2-marks each from the syllabus of the **relevant Trade / Branch subject**, as chosen by the applicant from Table – I.
vi. **All the eight Engineering Trade/Branch papers will be in ONE Question Paper.**
vii. **Section D (b)** will be after the compulsory sections of Physics (Section A), Chemistry (Section B), Mathematics (Section C) and Common Engineering Sciences (Section D (a)).

(iii) NEE-II (PCB): Candidates, seeking admission to 4 years' Degree program in **Forestry,** with academic qualification of 10+2 with Physics, Chemistry and Biology shall have to attempt **NEE-II (PCB).** Question paper under this scheme consists of three sections viz. Section A (Physics), Section B (Chemistry) and Section C (Biology).***Paper code for this scheme is 29.***

ELIGIBILITY FOR NEE-II

Maximum Age Limits as on **31st July, 2019** are 23 years for the students of the general category (GE) (**born on or after 1st August, 1996**), 26 years for OBC and female applicants (**born on or after 1st August, 1993**) and 28 years for ST/SC/PD (**born on or after 1st August, 1991**).

Academic Qualifications for different schemes/modes of NEE-II:

(i) NEE-II (PCM): Applicants must have passed in 10+2(PCM)/ Higher Secondary (PCM) with Physics, Chemistry and Mathematics (PCM).

(ii) NEE-II (Vocational):

Applicants must have passed10+2(Vocational) / ITI / NERIST Certificate in any one of the branches / trades, viz., [Agricultural Engineering] Farm Equipment (FE) / Food Processing (FP); [Civil Engineering] Construction Technology i.e. Draftsmanship / Surveyor (CT); [Electronics and Communications Engineering] Electronics Technology or Electronics Maintenance (ET/EM); [Electrical Engineering] Electrical Technology or Electrical Maintenance (ET/EM); [Mechanical Engineering] Mechanical Craftsmanship (MC) / Automobile Technology (AT) and Refrigeration & Air Conditioning (R&AC) are eligible.

Candidates, who are selected for admission to Technology Stream under NEE-II (PCM)/NEE-II(Vocational), shall have the choice of branch during counseling out of the six branches / disciplines, viz., AE, CE, CSE, EE, ECE and ME on the basis of their merit and reservation category.

(iii) NEE-II (PCB): Applicants must have passed in 10+2(PCB)/ Higher Secondary (PCB) with Physics, Chemistry and Biology (PCB).

Details of eligibility criteria, examination schemes and paper codes are given in **Table – I**.

15.3. NEE-III (Paper Codes 30 to 35):

There will be a single question paper of 150 marks consisting of four sections of three hours' duration, including one section of the relevant branch subject according to their qualifying examination.

Examination Scheme for NEE-III

Candidates, seeking admission in Degree Module of **Technology Stream,** with academic qualification of Diploma in relevant branch/discipline, shall have to attempt **NEE-III.** Question paper for NEE-III consists of four sections viz. Section A (Physics), Section B (Chemistry), Section C (Chemistry) and Section D (Branch Subject).

Important Notes:

i. Sections **A**, **B**, and **C** are **compulsory for all**.
ii. Section D will contain 30 questions of 1-mark each & 20 questions of 2-marks each from the syllabus of the **relevant Branch**, as chosen by the applicants according to their educational qualification.
iii. **Candidates have to select only ONE of the Engineering subject out of total Six Engineering Branches (Codes 30 to 35: Details given in Table – I)** as per the code given in the Admit Card.
iv. **Questions for all the Six Engineering Branch subjects will be in ONE Question Paper.**
v. Section D will be after the compulsory sections of Physics (Section A), Chemistry (Section B)and Mathematics (Section C).

ELIGIBILITY FOR NEE-III

Maximum Age Limits as on **31st July, 2019** are 40 years for the students of the general category (GE) (**born on or after 1st August, 1979**), 43 years for OBC and female applicants (**born on or after 1st August, 1976**) and 45 years for ST/SC/PD (**born on or after 1st August, 1974**).

Academic Qualifications for NEE-III :

Applicants must have passed the 3-year Diploma course from any Government recognized polytechnic / institution in the respective or **allied discipline/ branch as per the Appendix-III** given in this Information Brochure *with a minimum of60% marks considering aggregate marks of all the three years' together/CGPA of 6.0 on a 10 point scale*or *NERIST Diploma Module with a minimum of CGPA 6.0*. **Those applicants who do not possess their qualifications as per the disciplines/branches mentioned in Appendix-III are not eligible for the admission.**

Details of eligibility criteria, examination scheme and paper codes are given in **Table – I**.

TABLE – I : ELIGIBILITY CRITERIA, EXAMINATION SCHEME AND EXAM PAPER CODES FOR NEE-I, NEE-II & NEE-III

Exam-ination	Academic Qualification	Age Criteria	Eligible for Admission to	Scheme of Examination	Exam Paper Code
NEE-I	Class X/ Madhyamic / Secondary with Science & Mathematics	**Maximum Age Limits** as on **31st July, 2019** are 19 years for GE (**born on or after 1st August, 2000**), 22 years for OBC and female applicants (**born on or after 1st August, 1997**) and24 years for ST/SC/PD (**born on or after 1st August, 1995**).	Base (Certificate) Module of Technology Stream (AE/ CE/ ECE/ EE/ ME)	Section-A (Physics): 35 marks. 35 questions of 1-mark each Section-B (Chemistry): 35 marks. 35 questions of 1-mark each Section-C (Mathematics): 80 marks. 30 questions of 1-mark each 25 questions of 2-marks each	**10**
NEE-II	10+2/ Higher Secondary (PCM)	**Maximum Age Limits** as on **31st July, 2019** are 23 years for GE (**born on or after 1st August, 1996**), 26 years for OBC and female applicants (**born on or after 1st August, 1993**) and 28 years for ST/SC/PD (**born on or after 1st August, 1991**)	Diploma Module of Technology Stream (AE/ CE/ CSE/ ECE/ EE/ ME)	Section-A (Physics): 45 marks. 25 questions of 1-mark each 10 questions of 2-marks each Section-B (Chemistry): 45marks. 25 questions of 1-mark each 10 questions of 2-marks each Section-C (Mathematics): 60 marks. 30 questions of 1-mark each 15 questions of 2-marks each	**20**
	10+2 (Vocational) / ITI / NERIST Certificate in any trade		Diploma Module of Technology Stream (AE/ CE/ ECE/ EE/ ME)	Section-A (Physics): 25 marks. 25 questions of 1-mark each Section-B (Chemistry): 25 marks. 25 questions of 1-mark each Section-C (Mathematics): 30 marks. 30 questions of 1-mark each Section-D 30 questions of 1-mark each (*Vocational Subject*): 70 marks. 20 questions of 2-marks each	
				Section D – Farm Equipment	**21**
				Section D – Food Processing	**22**
				Section D – Construction Technology	**23**
				Section D – Electronics Technology/ Electronics Maintenance	**24**
				Section D – Electrical Technology/ Electrical Maintenance	**25**
				Section D – Mechanical Craftsmanship	**26**
				Section D – Automobile Technology	**27**
				Section D – Refrigeration and Air Conditioning	**28**
	10+2/ Higher Secondary (PCB)		Degree Module of Forestry	Section-A (Physics): 45 marks. 25 questions of 1-mark each 10 questions of 2-marks each Section-B (Chemistry): 45marks. 25 questions of 1-mark each 10 questions of 2-marks each Section-C (Biology): 60 marks. 30 questions of 1-mark each 15 questions of 2-marks each	**29**

TABLE – I : ELIGIBILITY CRITERIA, EXAMINATION SCHEME AND EXAM PAPER CODES FOR NEE-I, NEEII & NEE-III (CONTD)

Exam-ination	Academic Qualification	Age Criteria	Eligible for Admission to	Scheme of Examination	Exam Paper Code
NEE-III	3 Years Diploma in	**Maximum Age Limits** as on **31st July, 2019** are40 years for GE (**born on or after 1st August, 1979**), 43 years for OBC and female applicants(**born on or after 1st August, 1976**) and 45 years for ST/SC/PD (**born on or after 1st August, 1974**)	Degree Module in	Section-A (Physics): 25 marks. 25 questions of 1-mark each Section-B (Chemistry): 25 marks. 25 questions of 1-mark each Section-C (Mathematics): 30 marks. 30 questions of 1-mark each **and** Section-D. 30 questions of 1-mark each (Branch subject) : 70 marks 20 questions of 2-marks each	
	Agricultural Engineering or respective Allied branch as detailed in Appendix I		Agricultural Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject AE) 20 questions of 2-marks each	**30**
	Civil Engineering or respective Allied branch as detailed in Appendix I		Civil Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject CE) 20 questions of 2-marks each	**31**
	Computer Science and Engineering or respective Allied branch as detailed in Appendix I		Computer Science & Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject CSE) 20 questions of 2-marks each	**32**
	Electronics Engineering or respective Allied branch as detailed in Appendix I		Electronics & Communications Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject ECE) 20 questions of 2-marks each	**33**
	Electrical Engineering or respective Allied branch as detailed in Appendix I		Electrical Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject EE) 20 questions of 2-marks each	**34**
	Mechanical Engineering or respective Allied branch as detailed in Appendix I		Mechanical Engineering	Section-D: 70 marks. 30 questions of 1-mark each (Branch subject ME) 20 questions of 2-marks each	**35**

16. HOW TO APPLY

16.1. General information and procedure of online application :

How to apply for NEE I/NEE II/NEE III for 2019

Before filling up the online application form, candidates must read the instructions given below very carefully. For any assistance please feel free to contact our HELPLINE NO: 91 9713387094, +91 9713387495.
For any query, a candidate can also send an email to :- infonee@nerist.ac.in

A) Candidates must apply for NEE-2019 **"ONLINE"** ONLY by logging in the website www.neeonline.ac.in.

a. Candidates must follow the instructions strictly as appear in the instruction panel.

b. Candidates can fill up the entire form in one session or enter one part of the information and save and complete the same at a later stage within the due dates of filling and submitting the form. Candidates are requested to carefully check all the data entered before final submission of form. Any error may lead to rejection of their application at any stage of time.

c. **Be careful while filling up each of the fields or selecting an option from the drop down menu such as reservation code** etc. For example, a list of Reservation code is mentioned along with the relevant field so that you can select the correct Reservation code based on your state and category.

d. Candidates appearing in the qualifying examination in 2019 are also eligible to apply. However, they must produce mark sheets / grade cards/ pass certificates on the day of counseling/admission. Otherwise their selection will be cancelled.

e. Online application can be done within 11/01/2019 and 25/03/2019.

f. Application fee is **Rs. 600/-+**Payment gateway charges/bank transaction charges for SC/ST/PD candidates, and

Rs.1000/- + Payment gateway charges / bank transaction charges for GENERAL/OBC and all other candidates. **Application Fee Paid is non-refundable/ Non transferable any case.**

g. After the final submission of application form, no changes can be made by the applicant in her / his online application.

h. Request for change of any kind of data such as category, centre of examination, etc. shall summarily be rejected. Application once submitted shall be final.

Guidelines to fill up the Online Application Form

NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE &TECHNOLOGY
Academic Session 2019-2020

Applicants are required to keep the following things ready before applying:

1. An E-mail ID for registration and for receiving all future correspondence till the admission process is ove rand subsequently, if admitted.
2. One Mobile Number to receive SMS based notifications/communications related to the online application; Admit card etc till the admission process is over and subsequently, if admitted.
3. Facility with internet connectivity.
4. A recent **scanned** passport sized colour photograph (for scanning and uploading in ".JPEG/.JPG" format only. File size of scanned photograph should not be more than 100KB).
5. Your **scanned** signature using **Blue/Black** pen on whitesheet (for scanningand uploading in ".JPEG/.JPG" format only. File size of scanned photograph should not be more than 100KB).
6. Access to an online payment facility/service such as:
    a) Net Banking
    b) Credit card
    c) ATM-cum-Debit card

Important Notes for all applicants:

1. A printout of the submitted complete Application form is to be retained with the candidate, which is to be submitted at the time of counselling /admission, if selected?
2. Original certificates issued by the competent authority supporting your filled in details will be asked from you ONLY at the time of Counselling/admission. **If data provided in the online application is not supported by appropriate documents then your application/claim for admission shall be summarily rejected.**

Steps to be followed for filling the online application:

The entire process of filling online application form can be completed in below mentioned 9 steps.

The steps are:

1. Register yourself for the online application process at the North Eastern Regional Institute of Science and Technology (Application Portal– **www.neeonline.ac.in**)
2. Activate your online Application with the Email ID and Your Activation Code; send it to your submitted Email ID/ Mobile No in registration process.
3. Selection of the Program Type & Program Name and check eligibility.
4. If the applicant confirms the eligibility criteria and continues the Program, the next web page appears. The applicant is required to click on “Application Details”. The application form

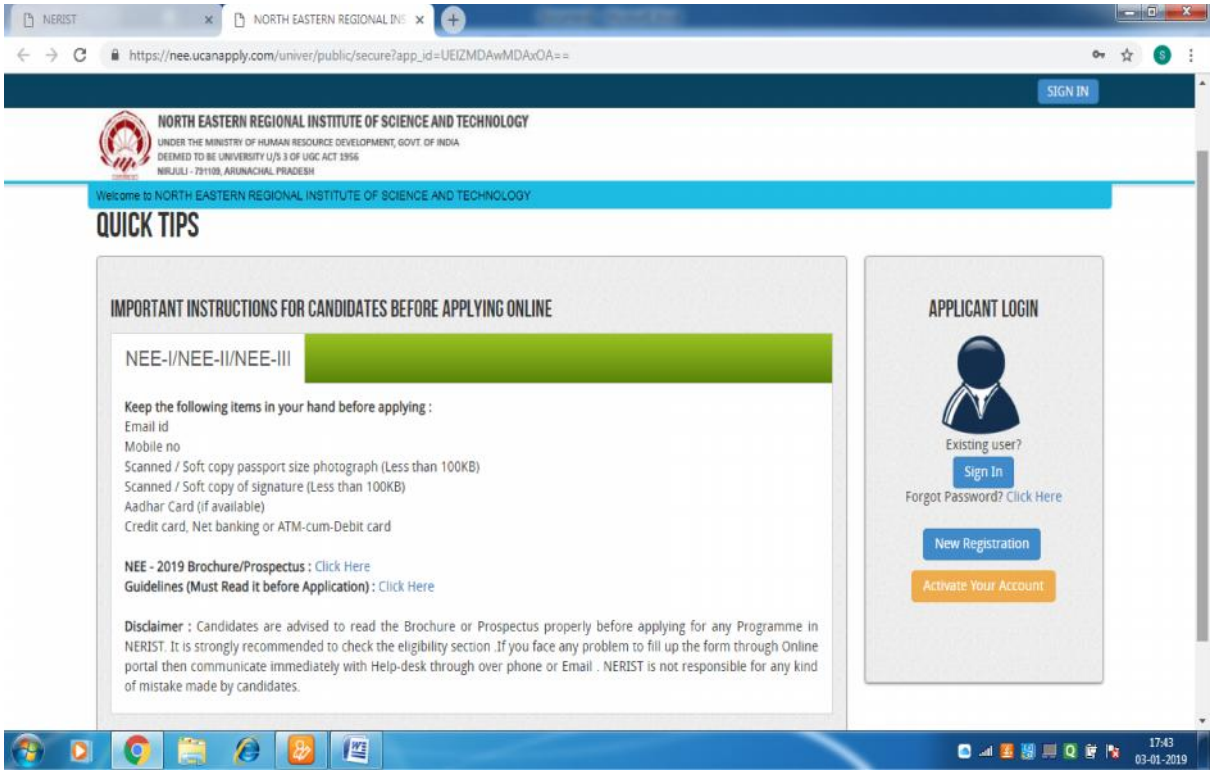
will appear on the screen. The applicant is required to fill up the details in the application form.

5. In the next step, the applicant is required to upload scanned image file of his/her Photograph and Signature one by one [as specified in Para4 & 5 above].
6. In the next step, the applicant is required to fill the Academic details.
7. In the next step, the applicant is required to choose your Examination Centre preference
8. Once all the details are filled in, the candidate is required to Review the details entered and Confirm. No edit will be allowed oncethe application is confirmed.
9. Payment of fee's through online.

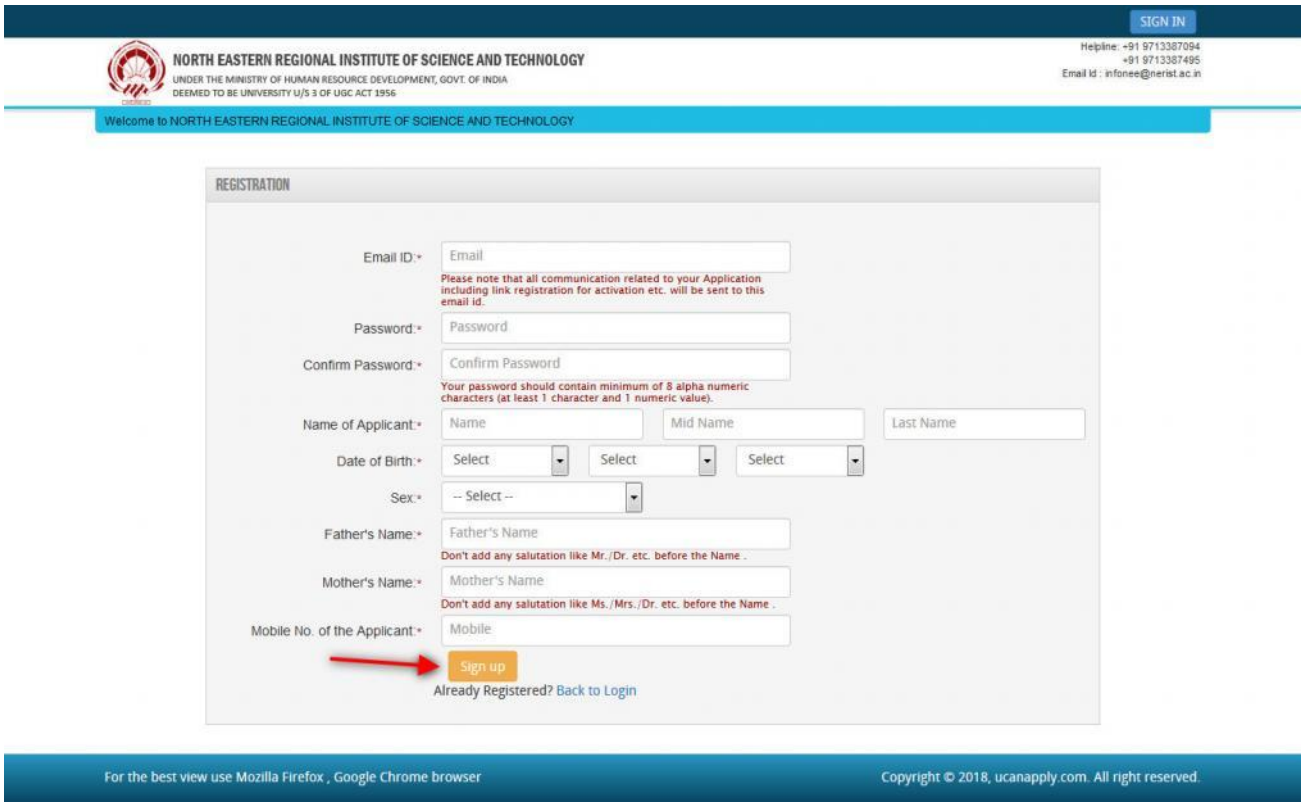
How to complete Registration on the North Eastern Regional Institute of Science and Technology (NEE) Admission Portal(www.neeonline.ac.in)for Online Application Process?

Step1: Please click on **"Apply for Admission"** button given on the home page of the NEE Application Portal.

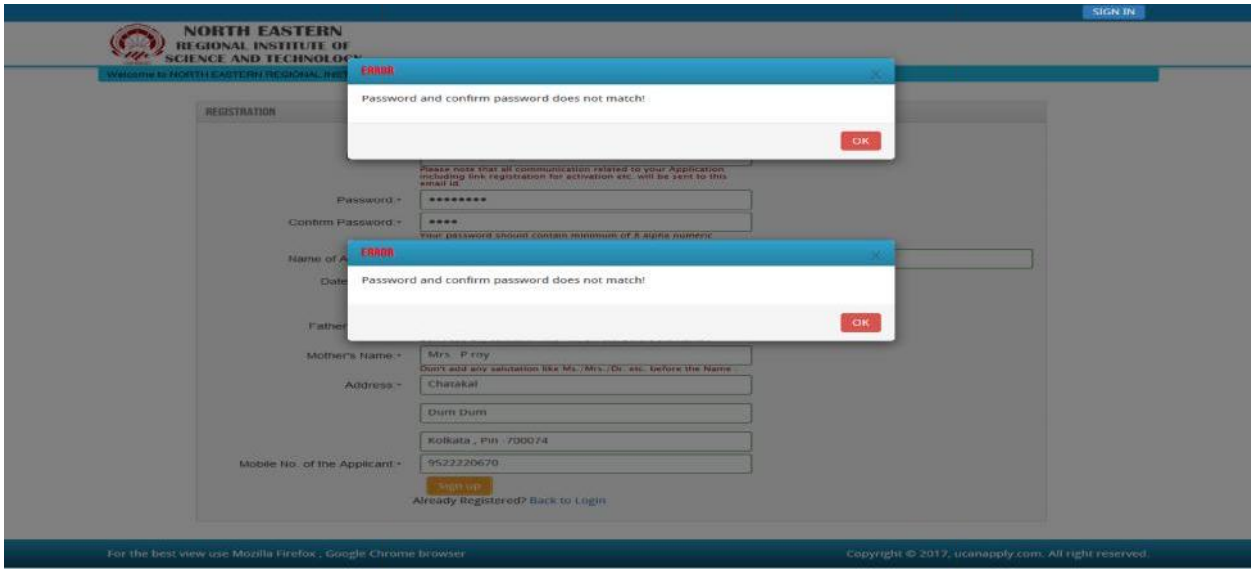
Step2: On clicking the link, you will be directed to a new page having an Applicant Login Box. Below the login fields there is a link **"New Registration"**. Please click on this link.



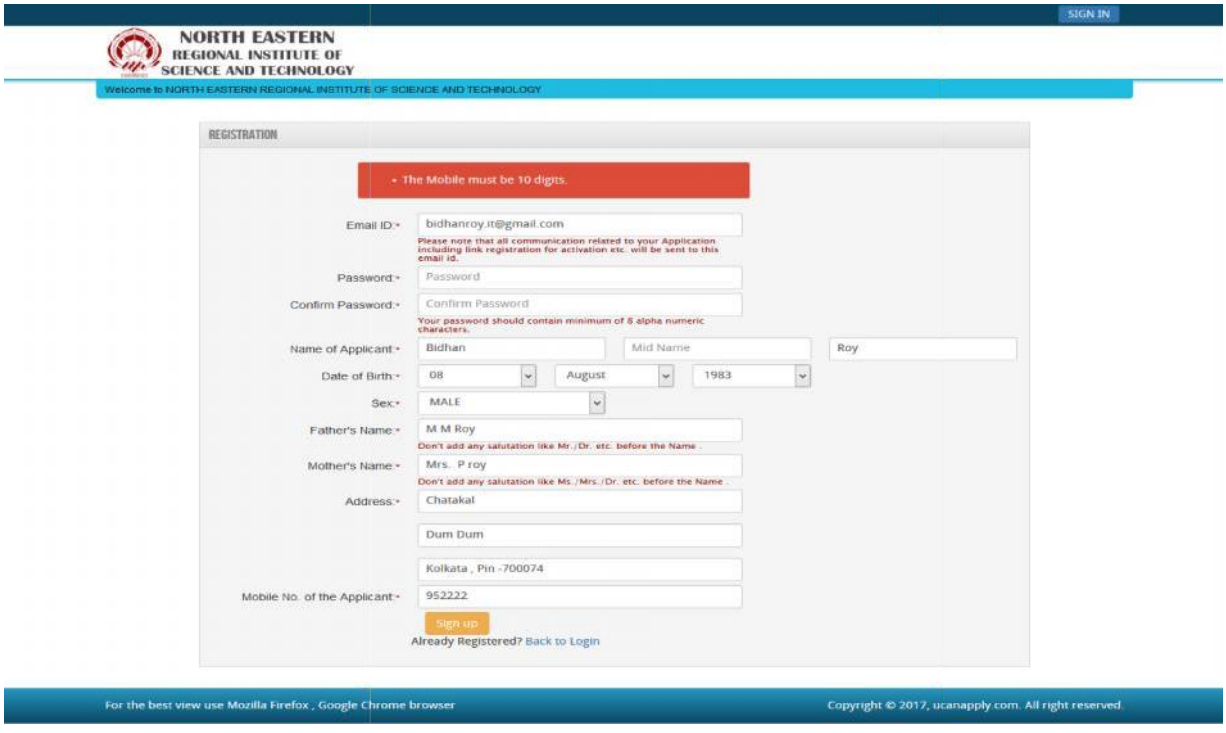
Step3: When you click the link you will be shown a Registration Form asking for various details. Fields for information which is mandatory is marked with "Red coloured bullets" and is to be essentially filled up. These fields cannot be left blank. Once you fill the details, you can click on the "**Signup**" button at the bottom for completing the registration process.



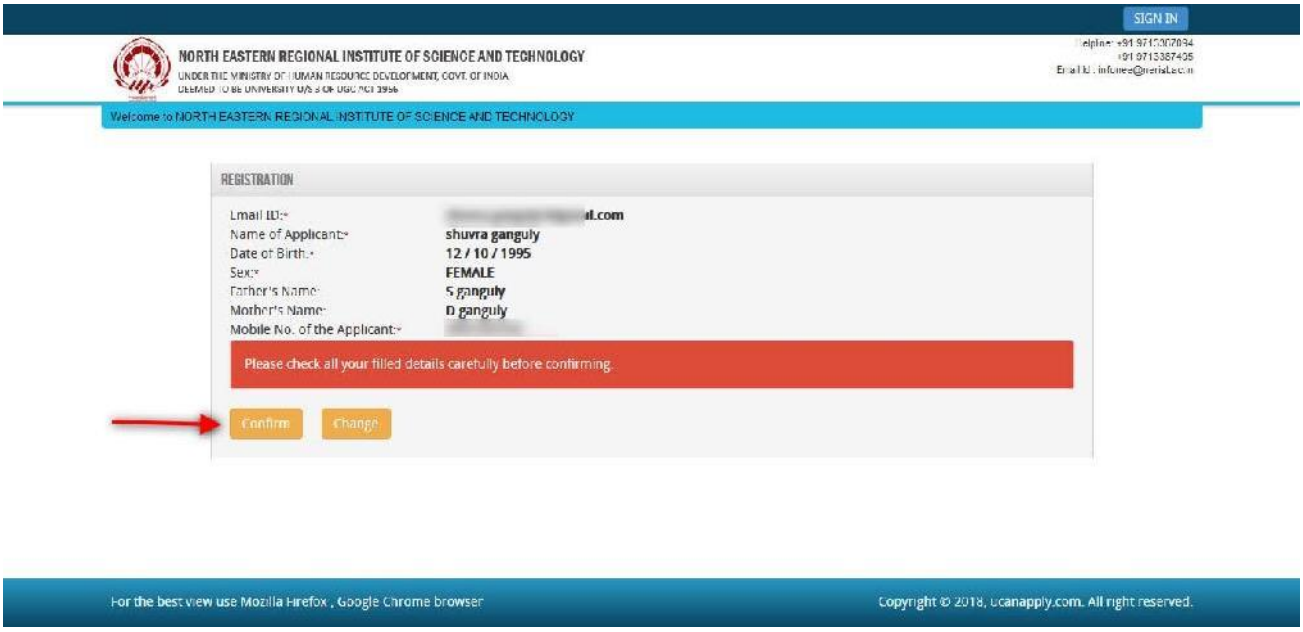
** Here Password and Confirm Password is most sensitive part, both should be same otherwise it will show error like the following,

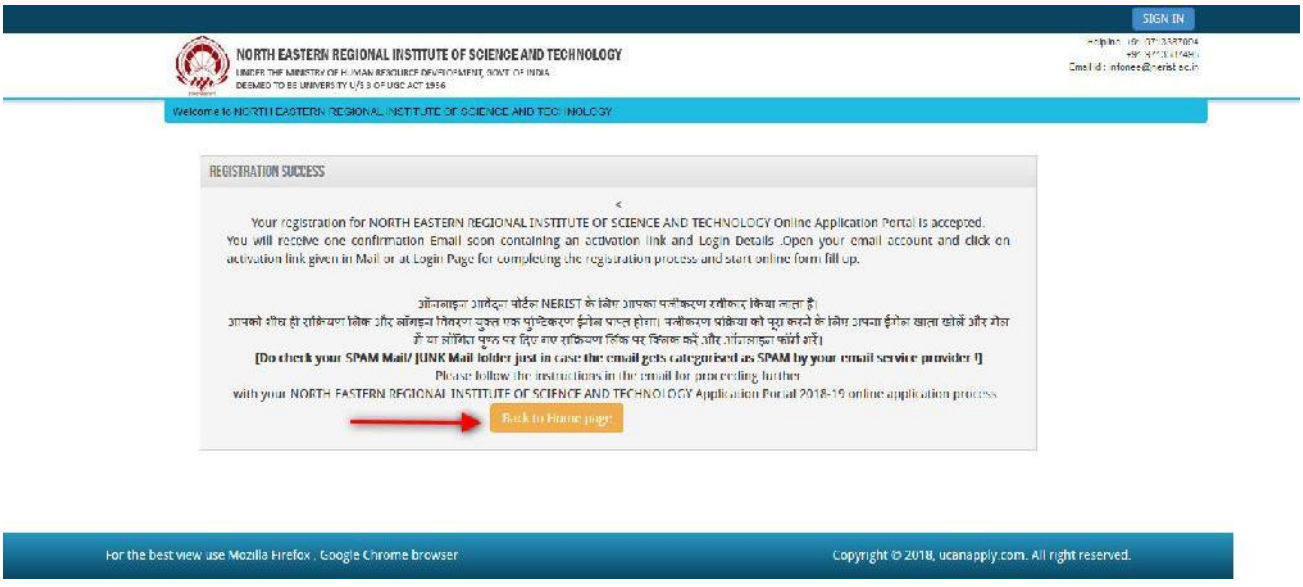


** Here Mobile no also most sensitive part, Mobile no should be10 digit otherwise it will show error like the following,



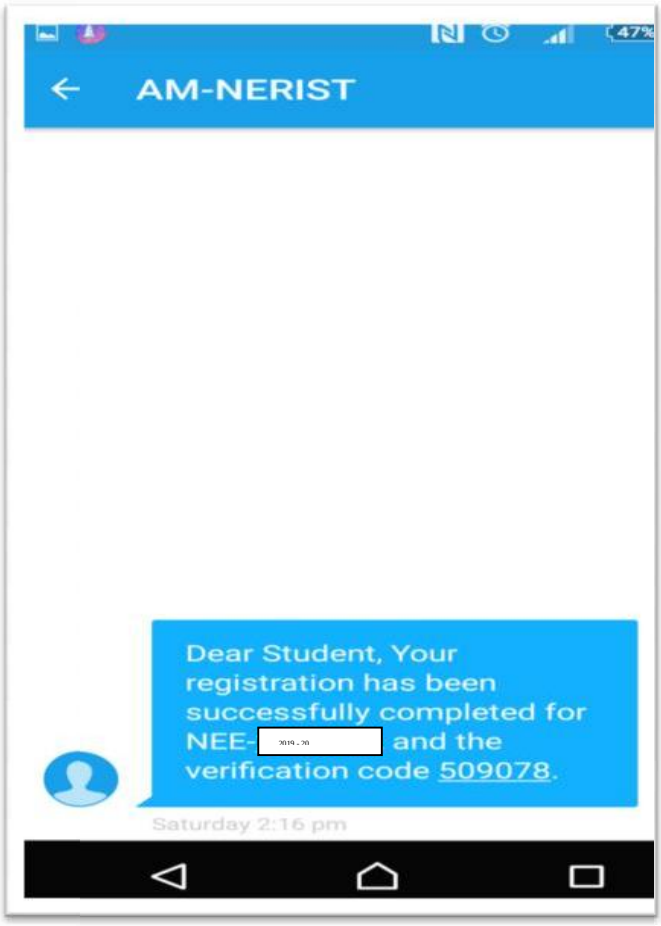
NOTE: PLEASE NOTETHATDETAILS SUBMITTED DURINGREGISTRATION CANNOT BE CHANGEDLATER.SO MAKE SURE YOUDO NOT MAKEERRORSIN THE INFORMATION YOU FILLIN THISFORM.





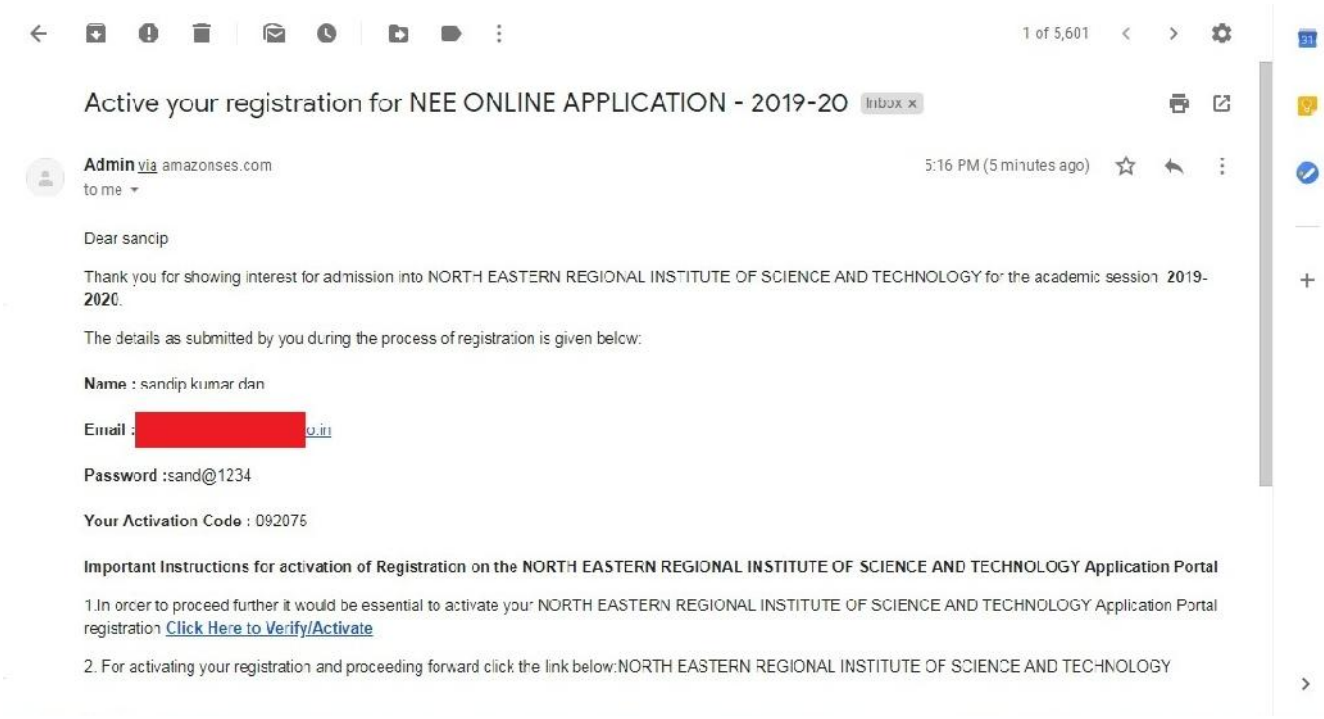
Step4: Activation and validation of Registration:

1. On successful submission of registration details, you would be shown a confirmation message on the screen. You will also **receive an e-mail** on the e-mail ID provided by you in the Registration Form and a validation code on your registered **mobile number**. This email will contain an **activation link**. You need to click on this activation link to confirm and complete your registration process.



Note: This confirmation and activation link e-mail might land up in your "Spam Folder "or "Junk Folder'. So, in case you do not find the registration confirmation e-mail in your "Inbox", please check your "Spam Folder" or "Junk Folder'. If you find thee-mail from *infonee@nerist.ac.in* in your "Spam Folder "or" Junk Folder', please report it as "Not Spam" and/or add the same to your contact list so that the subsequent e-mails from *infonee@nerist.ac.in* always come in your Inbox. Always check your "Spam Folder" or "Junk Folder" fore-mails from the NEE Admission Portal.

2. Click on this activation link received in thee-mail. Your account will not be activated until you have clicked on this activation link, so, ***do not forget this important step***.



Active your registration for NEE ONLINE APPLICATION - 2019-20 Inbox ×

1 of 5,601

Admin via amazonses.com
to me

5:16 PM (5 minutes ago)

Dear sancip

Thank you for showing interest for admission into NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY for the academic session **2019-2020**.

The details as submitted by you during the process of registration is given below:

Name : sandip kumar dan

Email : [redacted]o.in

Password :sand@1234

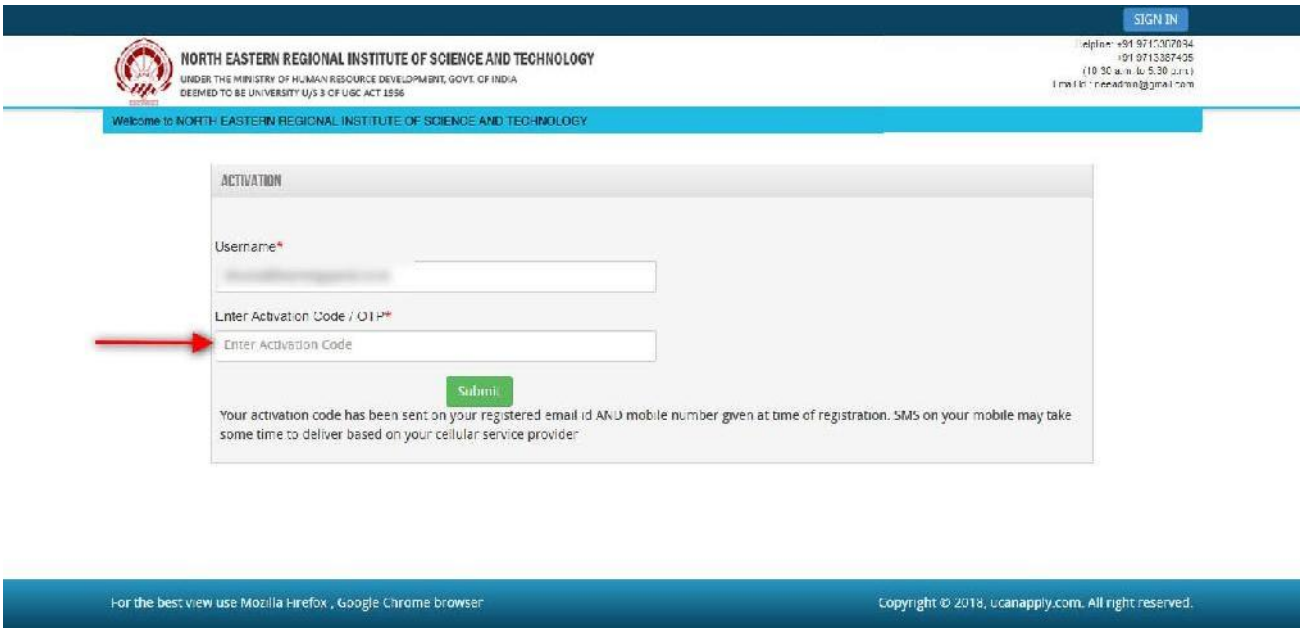
Your Activation Code : 092076

Important Instructions for activation of Registration on the NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY Application Portal

1.In order to proceed further it would be essential to activate your NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY Application Portal registration Click Here to Verify/Activate

2. For activating your registration and proceeding forward click the link below:NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY

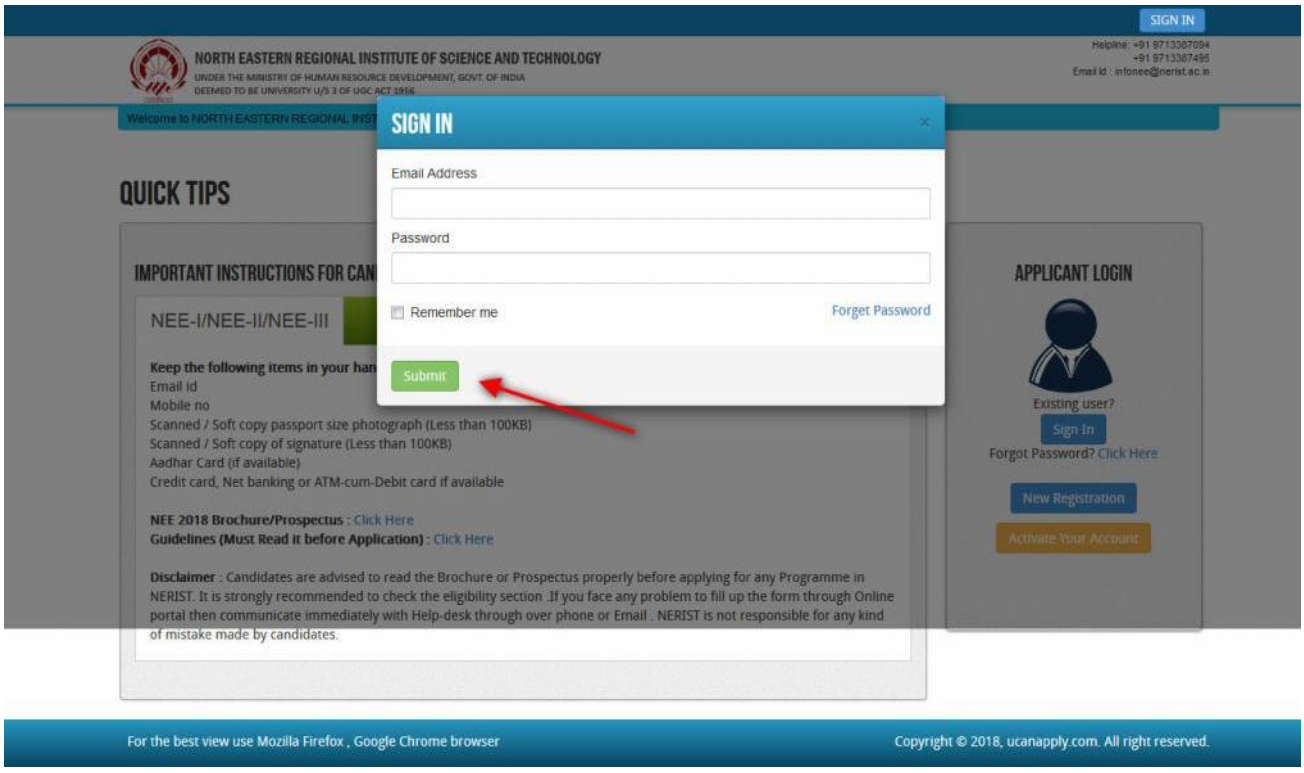
3. On clicking the activation link, you will be directed to the validation page in which you are required to give the validation code sent on your registered mobile number. Enter the validation code received on your registered mobile number to complete the registration process.



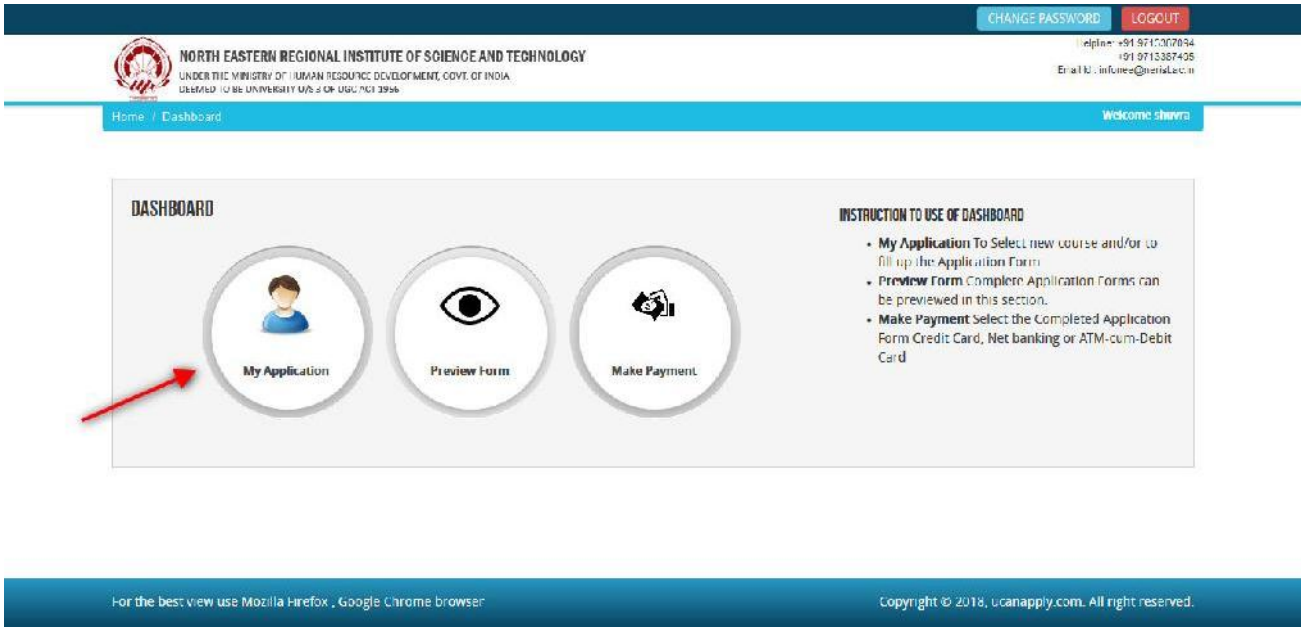
4. On successful validation, you will be allowed login and directed to My Application Section. Select the course of your choice and start filling up the application form online.

APPLICATION PROCESS:

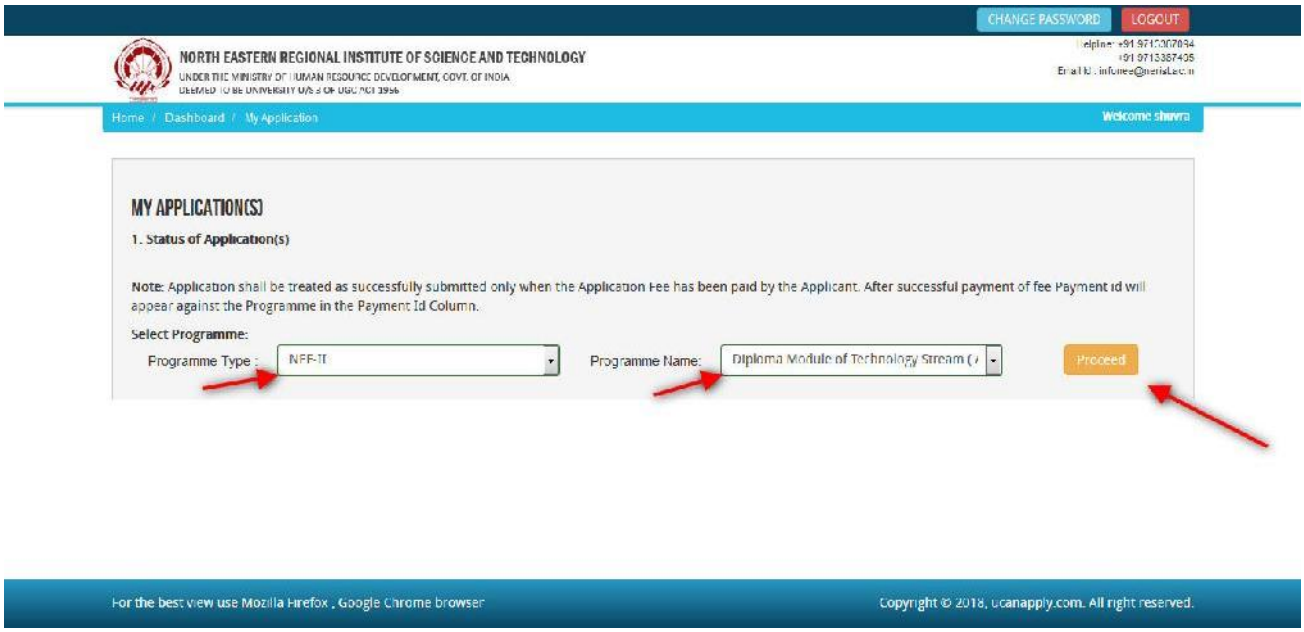
Step1: After activation and validation of your Registration on the North Eastern Regional Institute of Science and Technology (NEE) Admission Portal (www.neeonline.ac.in), youcan login into the programme.



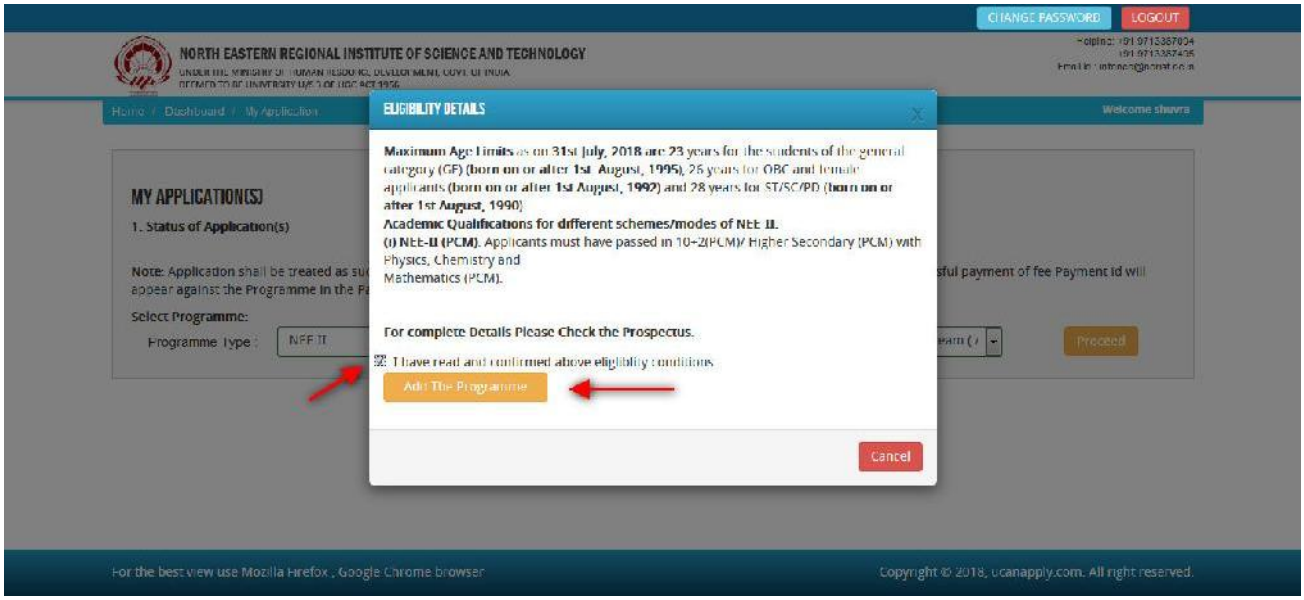
After log in you will be able to see dashboard and click "**My Application**"



Then you will be able to see following page with the title **"Status of Applications"**.

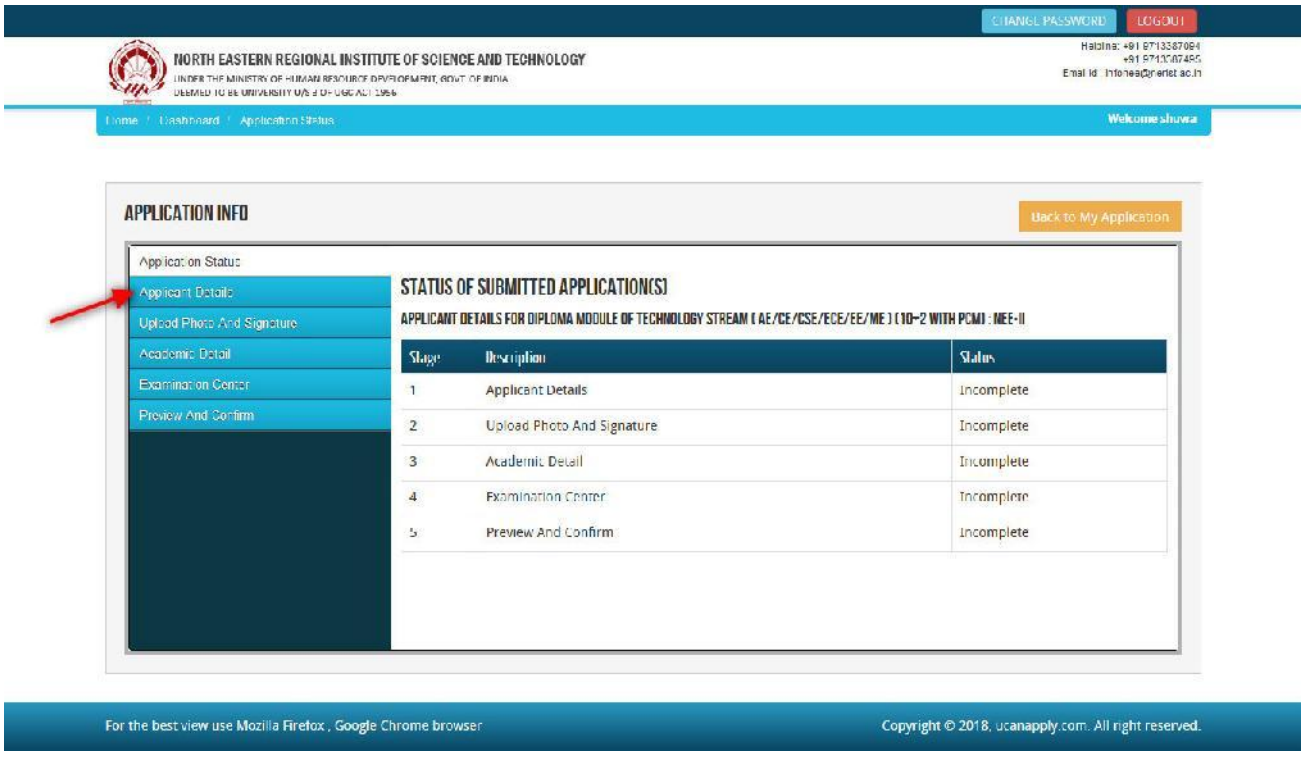


Step2: Please select your programme type, school and preferable first programme from the drop down boxes given at the bottom. Check the eligibility and in case you are eligible for the course click the checkbox given below regarding confirmation of the terms and conditions and the eligibility to proceed further for fillingup the application form by clicking **"Add Programme"** button.

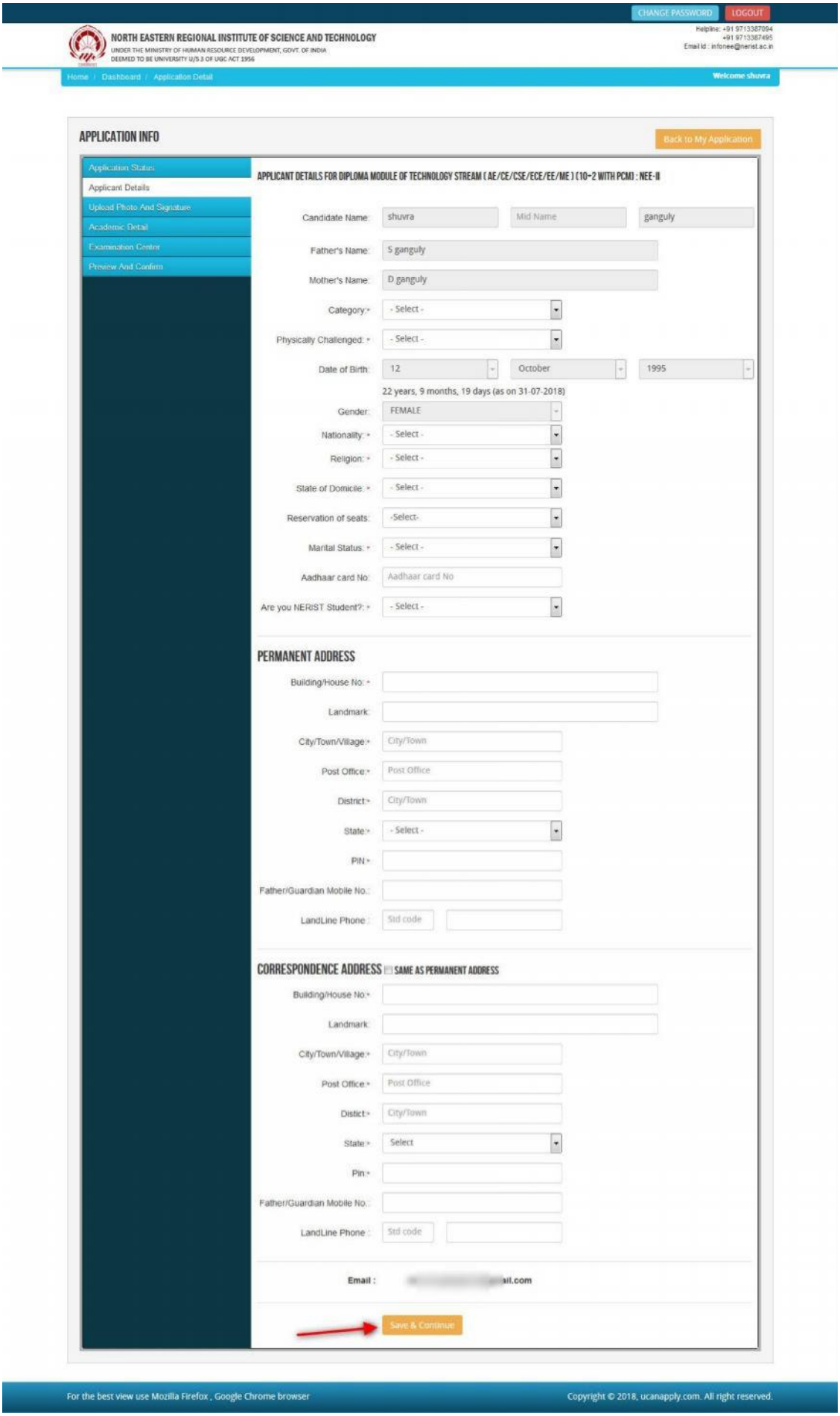


How to fill up the Application form after I have selected the Programme I wish to apply:

Step1: After you have added the first programme of your choice and come to the above screen, on clicking, following form will appear on the screen. Some of its fields would be pre-filled with the details you gave at the time of registration. Fill up other required details correctly.



Note: Mandatory fields have been marked with red asterisk. They are to be essentially filled up before you will be allowed to 'Save' of the form.


CHANGE PASSWORD
LOGOUT
NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY
UNDER THE MINISTRY OF HUMAN RESOURCE DEVELOPMENT, GOVT. OF INDIA
DEEMED TO BE UNIVERSITY U/S.3 OF UGC ACT 1956
Helpline: +91 9713387094
+91 9713387495
Email Id : infonee@nerist.ac.in
Home / Dashboard / Application Detail
Welcome shuvra
APPLICATION INFO
Back to My Application
Application Status
Applicant Details
Upload Photo And Signature
Academic Detail
Examination Centre
Preview And Confirm
APPLICANT DETAILS FOR DIPLOMA MODULE OF TECHNOLOGY STREAM (AE/CE/CSE/ECE/EE/ME) (10+2 WITH PCM) : NEE-II
Candidate Name: shuvra Mid Name ganguly
Father's Name: S ganguly
Mother's Name: D ganguly
Category: - Select -
Physically Challenged: - Select -
Date of Birth: 12 October 1995
22 years, 9 months, 19 days (as on 31-07-2018)
Gender: FEMALE
Nationality: - Select -
Religion: - Select -
State of Domicile: - Select -
Reservation of seats: -Select-
Marital Status: - Select -
Aadhaar card No: Aadhaar card No
Are you NERIST Student?: - Select -
PERMANENT ADDRESS
Building/House No:
Landmark:
City/Town/Village: City/Town
Post Office: Post Office
District: City/Town
State: - Select -
PIN:
Father/Guardian Mobile No.:
LandLine Phone : Std code
CORRESPONDENCE ADDRESS SAME AS PERMANENT ADDRESS
Building/House No:
Landmark:
City/Town/Village: City/Town
Post Office: Post Office
Distict: City/Town
State: Select
Pin:
Father/Guardian Mobile No.:
LandLine Phone : Std code
Email :
Save & Continue
For the best view use Mozilla Firefox , Google Chrome browser
Copyright © 2018, ucanapply.com. All right reserved.

Step2: After you have filled up all the required fields of the 'Applicant Details', Click on the 'Save & Continue 'button given at the bottom of the page (as shown above).

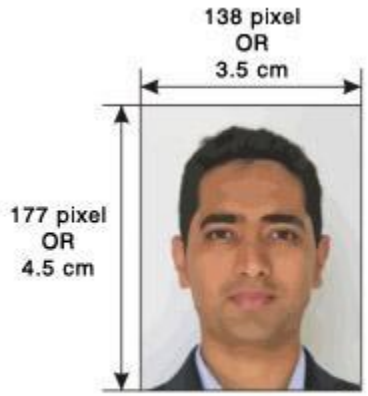
Note: For details related to specific fields in the application form, eligibility condition, number of seats, fee etc. please refer to the Information Bulletin available on the North Eastern Regional Institute of Science and Technology (NEE) Admission Portal (www.neeonline.ac.in)

Step3: After filling up application click the 'Save and Continue' Button given at the bottom.

Photo & Signature upload:

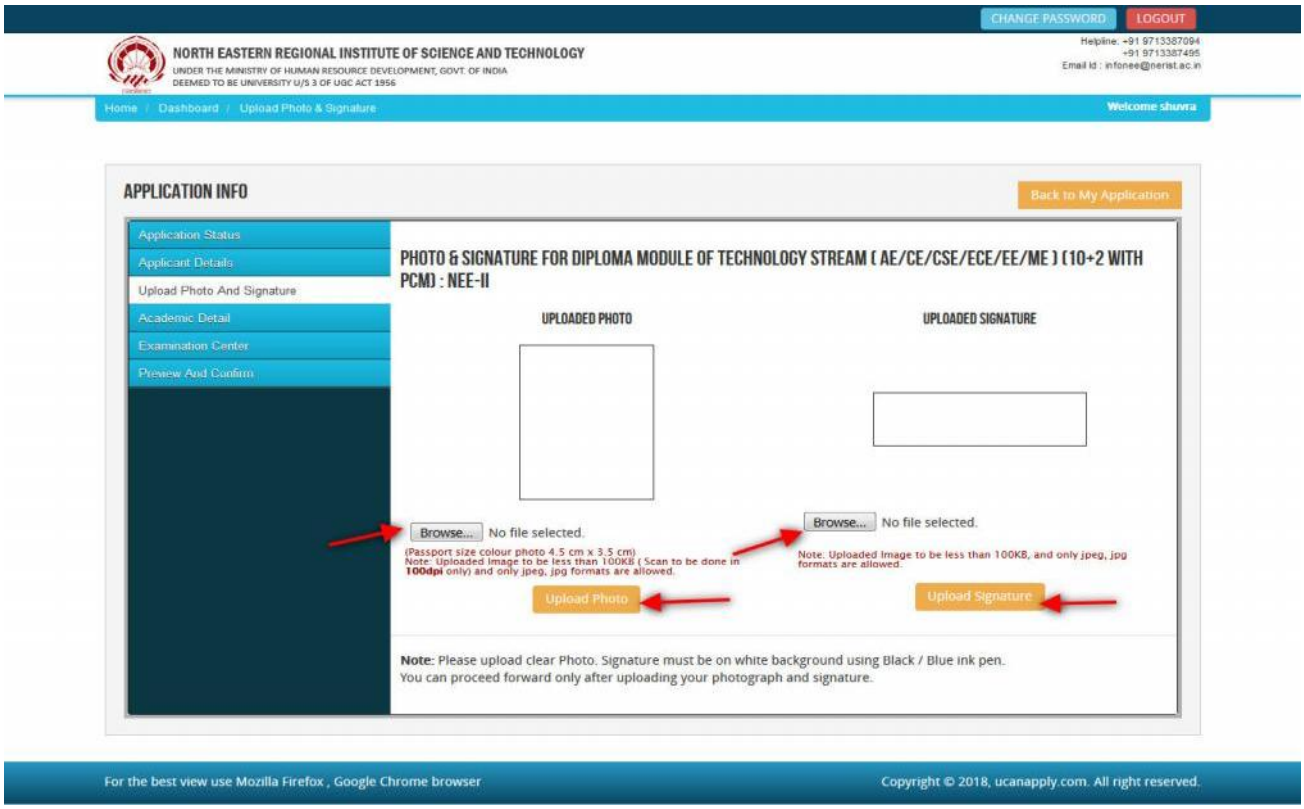
Step1: To upload the image file of you scanned passport size colour photograph and signature, click the button 'Upload Photograph and Signature' button available on the left panel. On clicking, you Will see the following screen:

(Your **scanned passport photo should be**within3.5 ×4.5 cm in size, file size should be less than 100KB.)

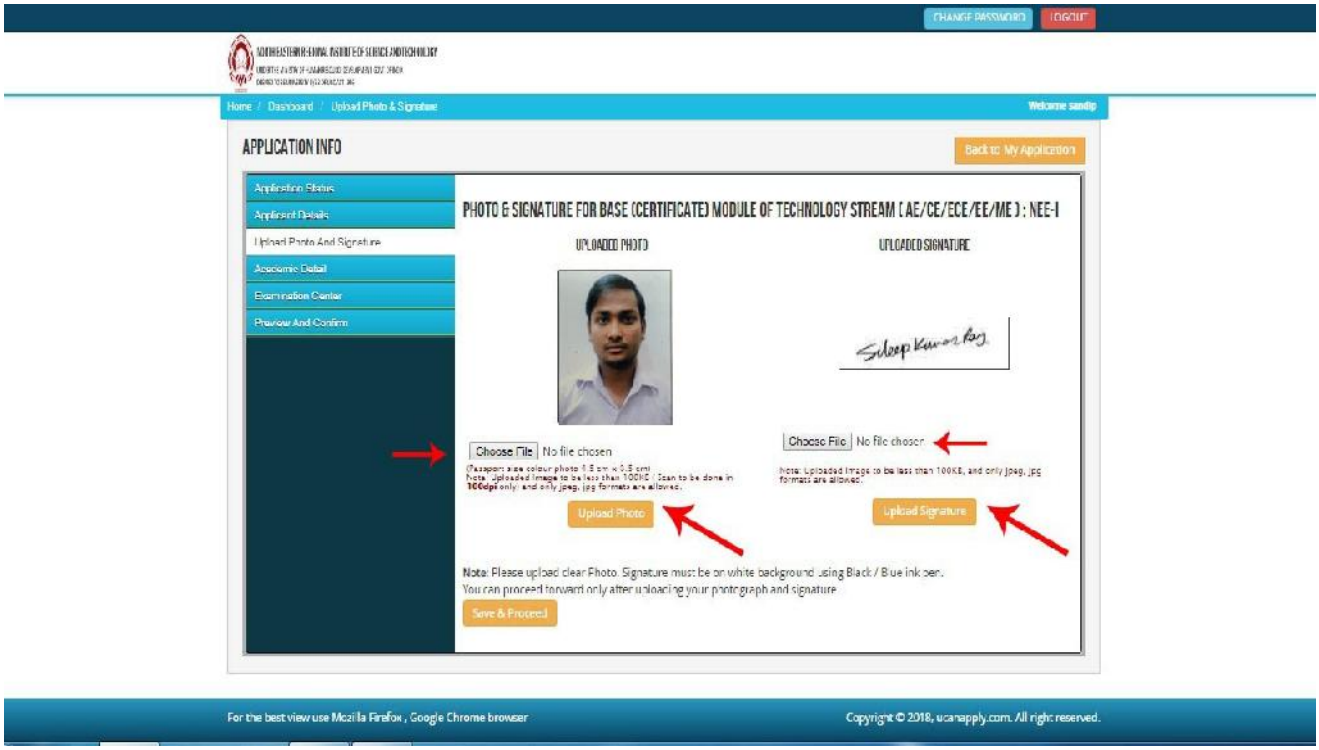


If you are facing any problem to upload your photo or rejected by the system then we are requested you to resize your photo as per the sample images shown here.
To resize your scanned photo please follow the following steps:

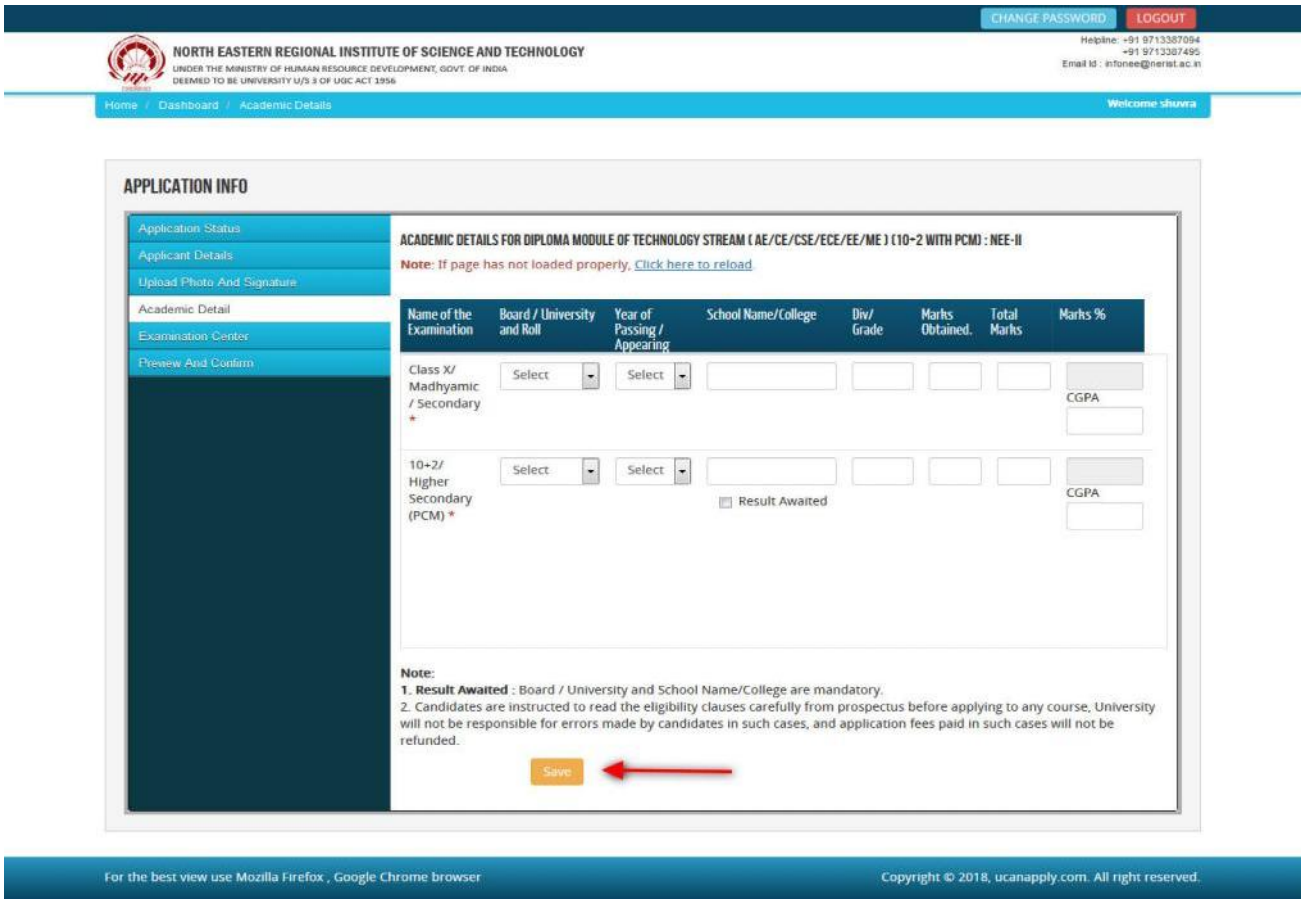
1. Right click on the scanned photo file→ Open with → Microsoft Office Picture Manager
2. Then look at the top menus, Click Picture→ Resize
3. Now look at the right panel, Select the radio button Custom width x height, And write width =138px, height =177px. Then Click OK to complete.
4. If you are not able to do this properly, then you can try 'Crop' feature for the 'Picture' menu
5. The save the file.



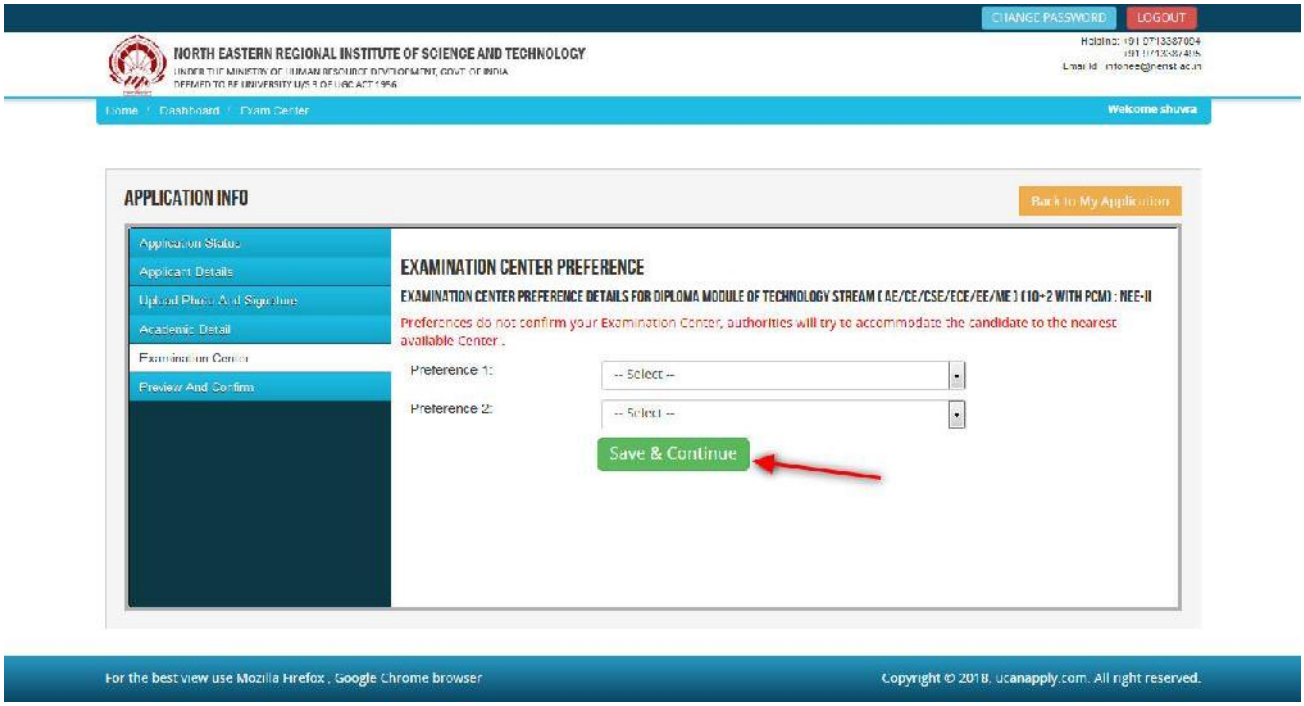
Step4: Choose the image file (".JPEG/.JPG" format; photo should bewithin4.5 ×3.5 cm in size, file size not more than 100 kb) of your scanned passport size photograph and signature and click the button 'Upload Photo' and 'Upload Signature' button given below the Box. After you have successfully uploaded the photograph and signature, you will see the following page:



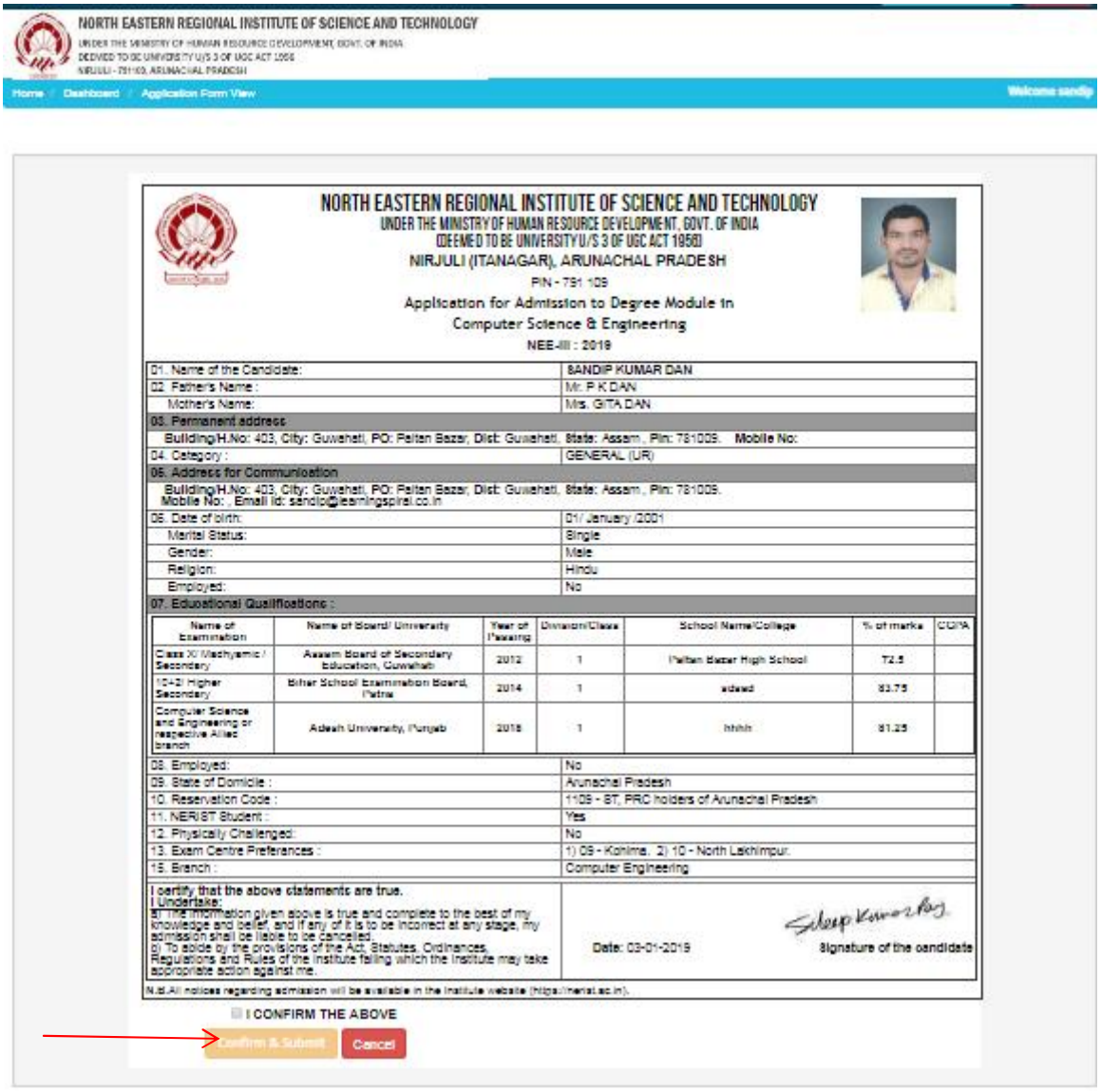
Step5: After filling up application click the 'Save and Proceed' Button given at the bottom you have filled up all the required fields of the '**Academic Details**', here you add your passed examination details and Click on the 'Save' button.



Step6: In the next stage, the candidate has to choose the "**Preferred Examination Centre**" and click on the 'Save & Continue' button.



Once the applicant completes filling up all the above mentioned stages of the Application Form, the complete Application Form will be opened. In case he/she wants to edit some details, he/she can do so, by clicking the '**Back**' button. To confirm the details entered, the candidate has to check the box and click on the '**Confirm & Submit**' button. **Once confirmed, it cannot be edited further.**



NORTH EASTERN REGIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY

UNDER THE MINISTRY OF HUMAN RESOURCE DEVELOPMENT, GOVT. OF INDIA

DEEMED TO BE UNIVERSITY U/S 3 OF UGC ACT 1956

NIRJULI (ITANAGAR), ARUNACHAL PRADESH

PIN - 791 109

Application for Admission to Degree Module in

Computer Science & Engineering

NEE-III : 2019

01. Name of the Candidate:	SANDIP KUMAR DAN
02. Father's Name :	Mr. P K DAN
Mother's Name:	Mrs. GITA DAN
03. Permanent address	
Building/H.No: 403, City: Guwahati, PO: Paltan Bazar, Dist: Guwahati, State: Assam , Pin: 781009. Mobile No:	
04. Category :	GENERAL (UR)
05. Address for Communication	
Building/H.No: 403, City: Guwahati, PO: Paltan Bazar, Dist: Guwahati, State: Assam , Pin: 781009. Mobile No: . Email Id: sandip@learningspiral.co.in	
06. Date of birth:	01/ January /2001
Marital Status:	Single
Gender:	Male
Religion:	Hindu
Employed:	No
07. Educational Qualifications :	

Name of Examination	Name of Board/ University	Year of Passing	Division/Class	School Name/College	% of marks	CGPA
Class X (Madhyamic / Secondary	Assam Board of Secondary Education, Guwahati	2012	1	Paltan Bazar High School	72.5	
10+2/ Higher Secondary	Bihar School Examination Board, Patna	2014	1	adwad	83.75	
Computer Science and Engineering or respective Allied branch	Adesh University, Punjab	2018	1	hhhh	81.25	

08. Employed:	No
09. State of Domicile :	Arunachal Pradesh
10. Reservation Code :	1109 - ST, PRC holders of Arunachal Pradesh
11. NERIST Student :	Yes
12. Physically Challenged:	No
13. Exam Centre Preferances :	1) 09 - Kohima. 2) 10 - North Lakhimpur.
15. Branch :	Computer Engineering

I certify that the above statements are true.
I Undertake:
a) The information given above is true and complete to the best of my knowledge and belief, and if any of it is to be incorrect at any stage, my admission shall be liable to be cancelled.
b) To abide by the provisions of the Act, Statutes, Ordinances, Regulations and Rules of the Institute failing which the Institute may take appropriate action against me.

Date: 03-01-2019

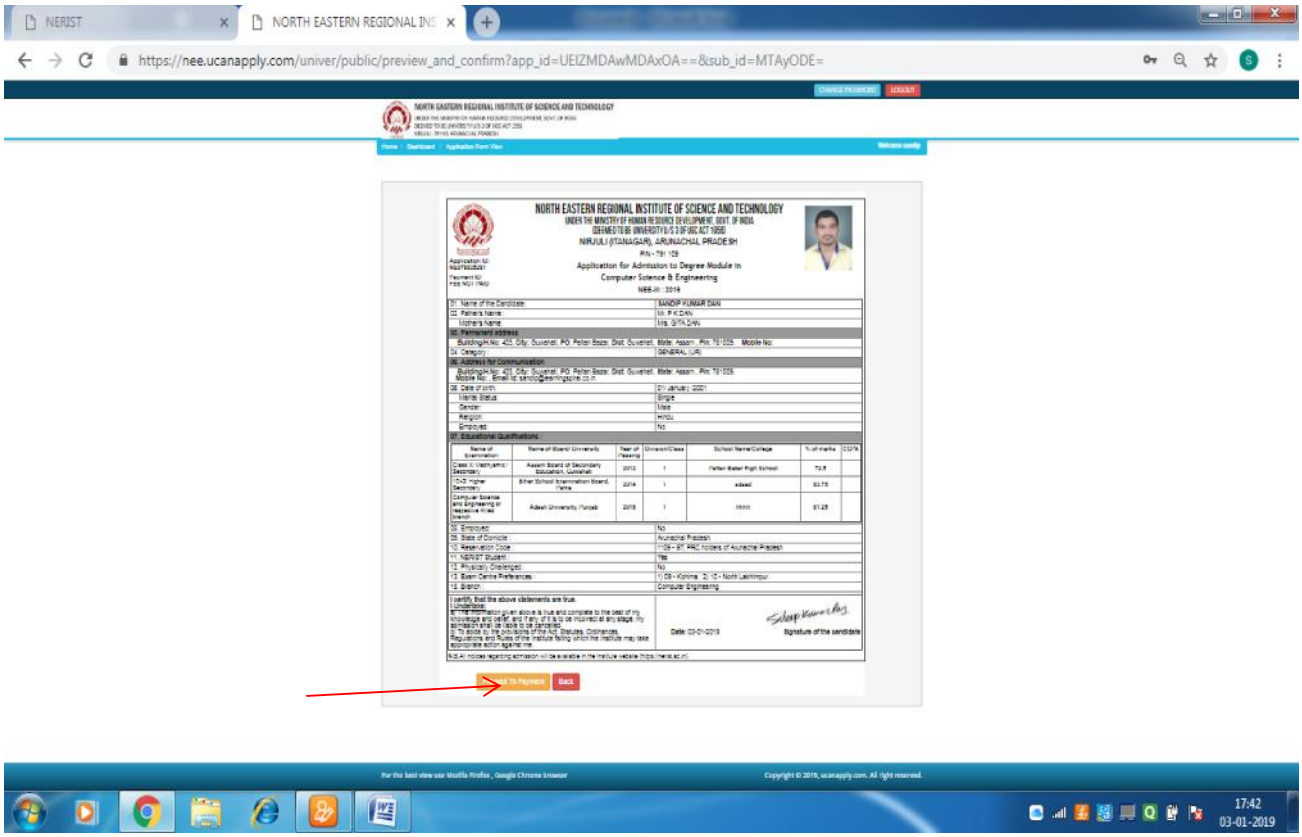
Signature of the candidate

N.B.All notices regarding admission will be available in the Institute website (https://nerist.ac.in).

I CONFIRM THE ABOVE

Confirm & Submit | Cancel

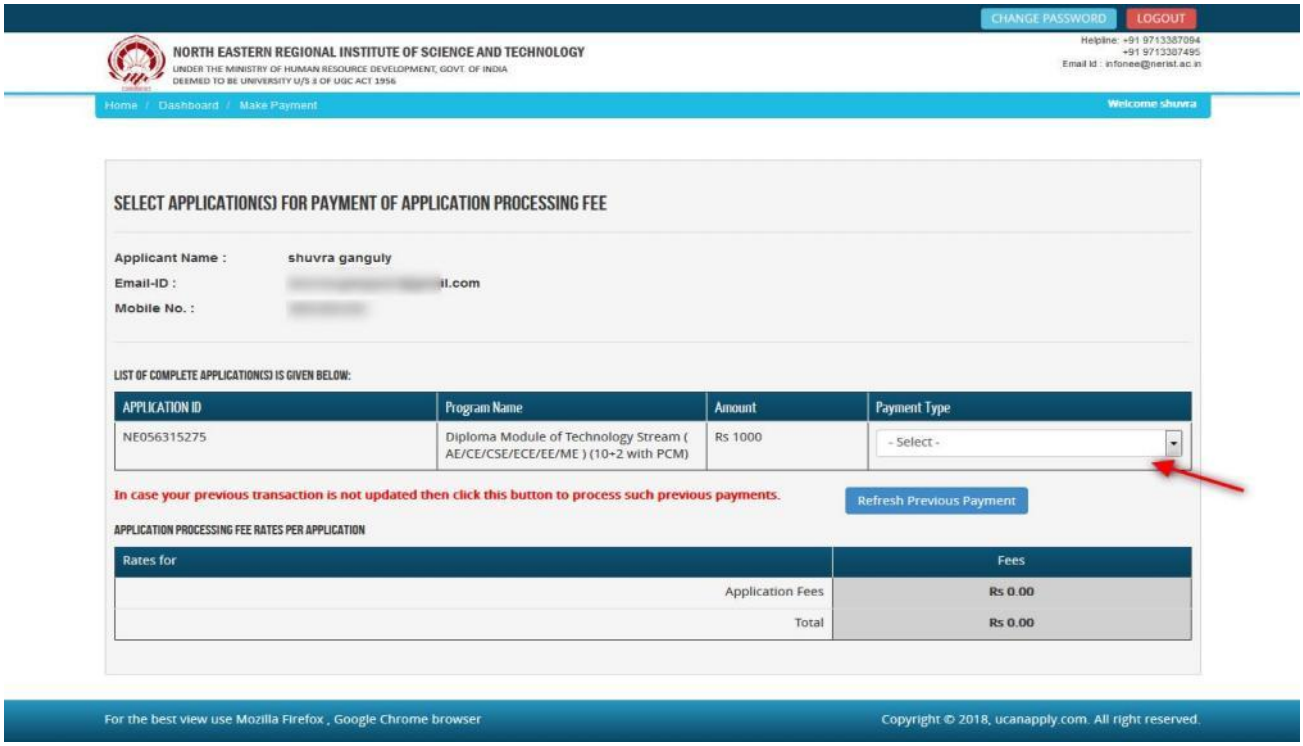
For the other subject system will go for **Applicant Form View** page. Here you can check all information which you have entered in your application process. If everything is ok then click the button "**I CONFIRMTHE ABOVE**" & Click "**Confirm & Submit**" button.



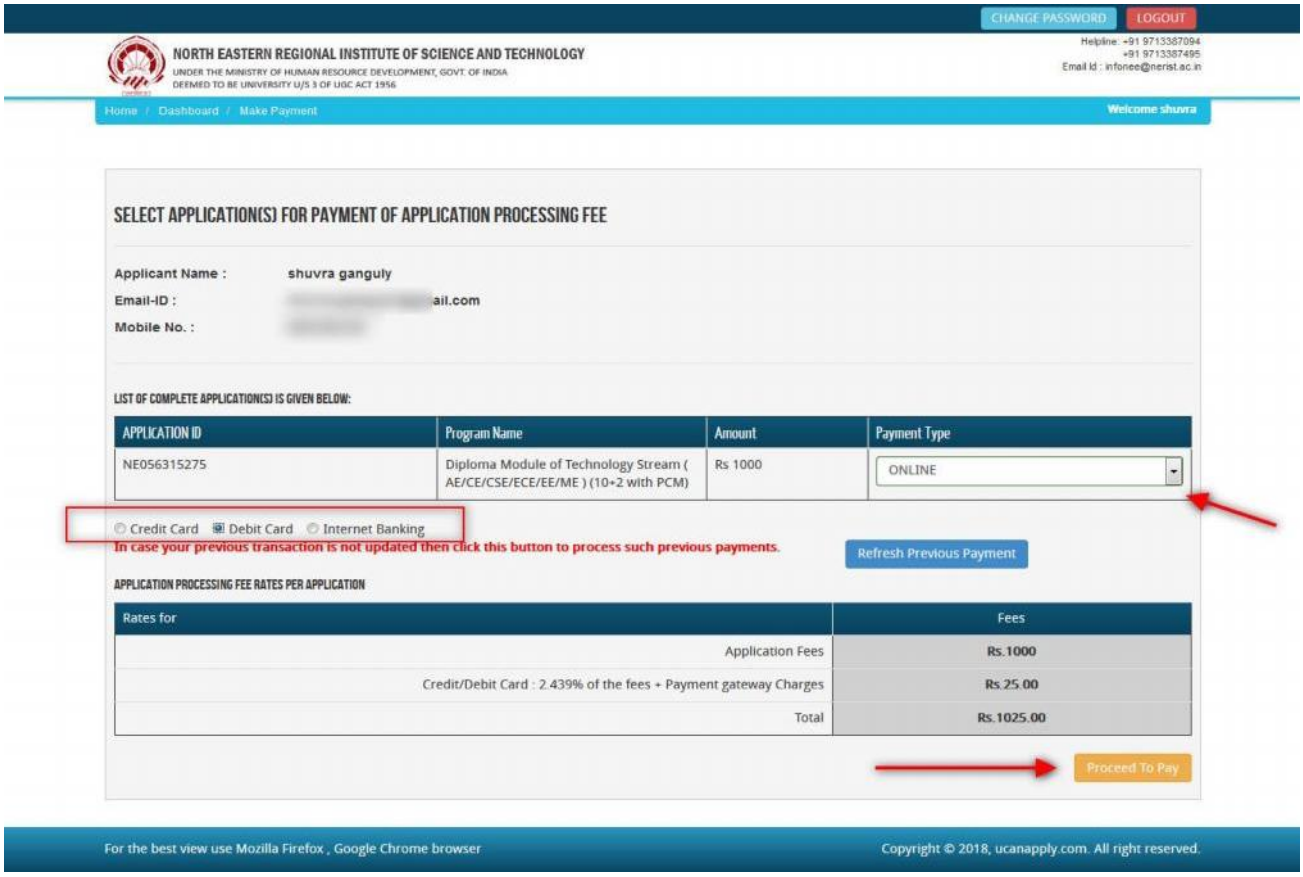
After that system will show you the "**Proceed to Payment**" button to complete the payment.

How to pay the Application Fees?

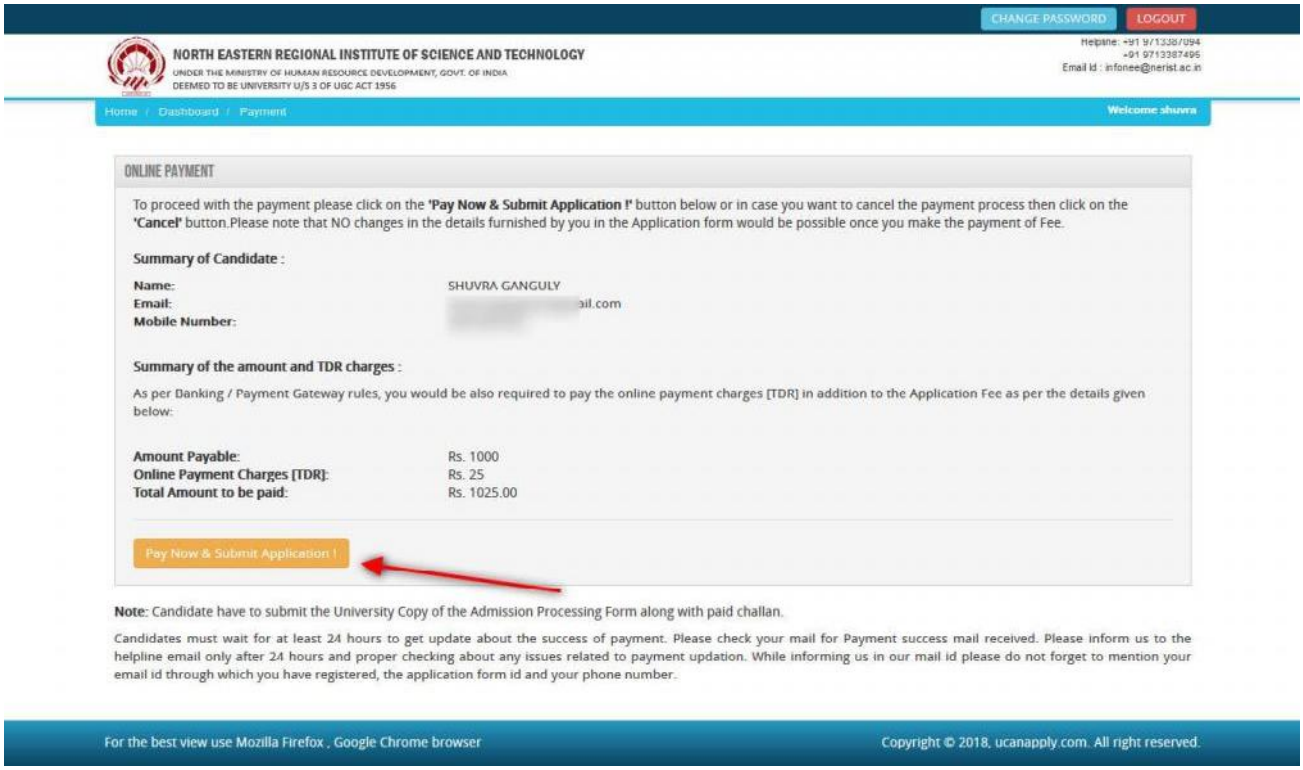
Step1: You will get dropdown for "**Payment Type**" here you can get ONLINE Payment type. Click here to make payment. On clicking you will see the following screen.



Step2: You can select the applications for which you want to pay the NEE Application Portal Online Fee by clicking "ONLINE" the check box given in the bottom left for "Select to pay". You have option of paying NEE Online Fees [using Credit Card/Debit Card/ Net Banking] through payment gateway available on the Portal [by clicking "Proceed to Pay"].



Step3: On clicking "**Proceed to Pay**", following screen will appear. Here you can check your summary and payment amount etc. Once you click "**Pay Now & Submit Application**" button then system will go for payment to your banking website. After a successful payment you will get Payment Successful message. And your application process is complete.



After a successful payment you can take the **Print** of the form and **Save** for future correspondence.

This will complete your online application form submission.

- Please visit the website **www.neeonline.ac.in** after **08/04/2019 for downloading Admit Card. You shall also receive an SMS on your registered mobile number and an e-mail notification in your verified e-mail id**, when your **Admit card** is **ready to be downloaded from the website. CANDIDATES NEED TO DOWNLOAD ADMIT CARD BY THEMSELVES BY LOGGING INTO THEIR RESPECTIVE IDs .**
  ADMIT CARD WILL NOT BE SENT BY POST TO ANY CANDIDATES
- **To download the Admit card,** candidate can either **enter their Registration No. in the requisite field** or **they can directly login to their panel using their user id and password. Print the Admit Card** and **carry** it to the examination hall. Without Admit Card you will not be allowed to take the exam and also you are advised to keep the Admit Card till the end of the admission process.The **Examination center will be mentioned on your Admit Card**.

16.2. EXAMINATION CENTRE CODE:

The NERIST Entrance Examination (NEE) will be conducted at 14 (*fourteen centers)*in the eight North Eastern States. The names of the centers are given in Table-2. An applicant should choose an appropriate Examination Centre code of two digit number (say XX) from the Table-1 as to where he/she desires to appear for the Entrance examination-2019. An applicant has to provide two choices of the examination centers while filling the ONLINE form for the NEE-2019. The first choice of Examination Centre exercised by an applicant is maintained as such. A center may not be available to a candidate, if number of applicants in that center exceeds the maximum capacity of the center. Also a center may be cancelled if sufficient numbers of applicants are not available in that center. In both the above-cases, the second choice of the examination center is allotted to the applicant.

Table-2. Examination Centre Codes:

Examination Centre Code (XX)	Name of Examination Centre
01	Agartala
02	Aizawl
03	Dibrugarh
04	Gangtok
05	Guwahati
06	Imphal
07	Itanagar
08	Pasighat
09	Kohima
10	North Lakhimpur
11	Shillong
12	Silchar
13	Tezpur
14	Bomdila

16.3.RESERVATION OF SEATS

Reservation of seats (see Table-3: Reservation of seats with its codes) is put under three different categories. A candidate seeking / claiming admission against a seat under any of the categories shall have to produce relevant certificate(s) at the time of counselling / admission. The categories are as under:
(i) State–quota: For candidates who belong to any of the Eight North Eastern States;

(ii) All India-quota: For candidates who belong to any of the States of India; and
(iii) PD-quota: For candidates with 40 to 75% Physical locomotor Disability (PD) belonging to any of the States of India.

The distribution of seats is such that out of the total number of seats in each of the modules for direct admissions, 80% of seats are reserved for candidates of the eight North Eastern States (10% for each state) as state-quota. Besides this, 7% of the total seats are filled up with Permanent Residence Certificate (PRC) holders of these eight North Eastern States on merit basis. 10% of the total seats are filled up with candidates under All India-quota; and 3% of the total seats are reserved for Physical locomotor Disabled (PD) persons under PD-quota.

Reservation Codes (Table-3): Admissions in Technology stream as well as in Forestry stream are taken on the basis of total seats allotted to the three different categories. So, an applicant must choose an appropriate reservation code based upon his/her eligibility from amongst the reservation codes given in Table-3 (Reservation of seats with its codes).

Please see Table-3 for Reservation of seats with its codes. Each reservation code is a 4-digit number, say ABXX. To read it from left to right, the first digit 'A' ranges from 1 to 9; and the numbers 1 to 8 denote 'State-quota' under the eight North Eastern States in alphabetic order, whereas number 9 denotes 'All India & PD-quotas' together. The second digit 'B' has got two numbers, 1 and 2. Number '1' is applicable to those applicants who have got Permanent Residential Certificate (PRC) of any of the eight North Eastern States, and number '2' is applicable to Non-PRC holder applicants of these States who have got other relevant certificate(s) to claim for a seat under State-quota of the respective eight North Eastern States. Besides this, number'2' is also applicable to all those applicants who belong to the All India or PD category. The digits 'XX' merely denote serial numbers in all the codes of the three categories of reservations.

Reservation of seats under All India & PD-quotas is open to all applicants (Indian Nationals), if they desire so, for a seat under such categories.

If no seat is available against a reserved category in a year in any of the modules, he/she can apply for other suitable category as appears in the instruction panel.

Important Note: Any deviation in documentary proof for the reservation code mentioned / chosen by an Applicant in his/her Application shall lead to summarily rejection of his/her candidature. Proof of eligibility against a reservation code, other than All India General category candidates, must be produced at the time of counseling/admission.

Table-3. Reservation of Seats with its Codes:

State	Reservation Code (ABXX)	Description of Reservation of seats
Arunachal Pradesh	1109	ST, PRC holders of Arunachal Pradesh
	1211	Wards of State Govt. Employee or State under taking employees of Arunachal Pradesh, Non-PRC holders.
	1212	Wards of Central Govt. or Central Govt. undertaking employees serving in Arunachal Pradesh, Non-PRC holders.
	1213	Other candidates (Non-PRC holders) residing in Arunachal Pradesh for not less than 3 years and not covered in any of the above reservation categories.
Assam	2101	General, PRC holders of Assam.
	2102	OBC, PRC holders of Assam.
	2103	SC, PRC holders of Assam.
	2104	ST, PRC holders from plain area of Assam.
	2105	ST, PRC holders from hill area of Assam.
	2210	Wards of Central Govt. / State Govt. or undertaking employees serving in Assam , Non-PRC holders.
Manipur	3101	General, PRC holders of Manipur.
	3102	OBC, PRC holders of Manipur
	3103	SC, PRC holders of Manipur.
	3109	ST, PRC holders of Manipur.
Meghalaya	4101	Open PRC holders of Meghalaya.
	4106	ST (Khasi /Jaintia) PRC holders from Meghalaya.
	4107	ST (Garo) PRC holders from Meghalaya.
	4108	SC & Other ST, PRC holders from Meghalaya.
	4229	PWD , PRC holders of Meghalaya
Mizoram	5109	Category-I (Zo-Ethinics indigenous people of Mizoram, Permanently residing in Mizoram)
	5211	Category-II (Non Zo-Ethinics permanent resident of Mizoram, Children of parent serving under Govt. of Mizoram or Corporation or Autonomous bodies, Chakmas)
	5212	Category-III (Children of Central Service Employees posted in Mizoram for at least 3 years)
Nagaland	6101	General, PRC holders of Nagaland.
	6109	ST of Nagaland.
Sikkim	7101	Merit (General), (Local with Sikkim Subject Certificate/Certificate of Identification)
	7102	State List OBC, (Local with Sikkim Subject Certificate/Certificate of Identification)
	7103	SC, (Local with Sikkim Subject Certificate/Certificate of Identification)
	7109	ST, (Excluding Bhutia&Lepcha) (Local with Sikkim Subject Certificate/Certificate of Identification)
	7114	Premitive Tribe of Sikkim
	7115	Bhutia&Lepcha , (Local with Sikkim Subject Certificate/Certificate of Identification)
	7202	Central List OBC
	7216	Others (children of business community and State Govt. employees of Sikkim who do not fall under the above categories of Sikkim).
Tripura	8101	General, PRC holders of Tripura.
	8103	SC, PRC holders of Tripura.
	8109	ST, PRC holders of Tripura.
All India	9201	General, Candidates from any of the States of India.
	9202	OBC, Candidates from any of the States of India.
	9203	SC, Candidates from any of the States of India.
	9209	ST, Candidates from any of the States of India.
Physically Disabled (PD)	9229	Physically Disabled/handicapped (PH) candidates, with 40% to 75% locomotor disability only, from any of the States of India.

16.4. EXAMINATION SCHEDULE

NEE-II & III : April 20th, 2019 (Saturday) from10:00 a.m. to 1:00 p.m.
NEE-I : April 21st,2019 (Sunday) from 10:00 a.m. to 1:00 p.m.

Note: On the day of the Examination, candidates must bring their Admit Cards, Black ball point pen, etc., to the Examination Hall. Calculator (non programmable) /Log tables are not allowed for NEE-I. However, these are allowed for NEE-II, NEE-II (Vocational) and NEE-III. In case of non-receipt of Admit Card, candidate must bring the photocopy of his/her Registration Confirmation page and two color photographs.

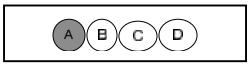
Mobile Phones/Communication Gadgets are NOT ALLOWED in the examination Hall.

To answer a question in the OMR Answer Sheet, candidate needs to darken the most appropriate bubble (only one) using Black ball point pen against that Question number.

For example,

Ques. No. 1: The chemical formula of common salt is: (A) NaCl (B) Na_2SO_4 (C) Na_3PO_4 (D) NaI.

Answer for Question no.1:



The option should be darkened like this as shown above if the choice of answer is (A).

17. Cut-off marks in NEE

There will be cut-off marks for the selection of candidates through NERIST Entrance Examinations.

18. Declaration of NEE result

The NEE-2018 results shall be declared by 15th May 2019 (Tentatively). However, an early declaration of results can be known through the NERIST web site: http: // **www.neeonline.ac.in/www.nerist.ac.in** and / or Directorates of Higher & Technical Education of the North Eastern States or through local newspapers of the North Eastern States.

19. Call for Counselling / Admission

Counseling/admission shall start, tentatively, from 15th July 2019onwards.Counselling dates shall be notified and shall be uploaded in the institute's website : www.nerist.ac.in**The names of the selected/waitlisted candidates, along with the date and time of counseling/admission will be uploaded on the institute website (www.nerist.ac.in).** Candidates can download their counseling letter from the website of the Institute. **No separate counseling letter shall be issued.** At the time of counseling/admission, the candidates will have to produce all the relevant original certificates/documents along with attested copies of all the relevant certificates/documents.

20. Certificates for Reservation of Seats:

(a) An Applicant with Physical-loco motor Disability (PD)should produce a certificate in prescribed format from a Medical Board (attached to Special Employment Exchange/Vocational Rehabilitation Centre for physically challenged persons) or a Medical Board at District level, in which an orthopedic Surgeon/Specialist in Physical Medicine and Rehabilitation should be a member, at the time of counseling/admission. If he/she fails to produce the original certificate for claiming PD-quota at the time of counseling/admission, his/her candidature shall be summarily rejected.

(b) Permanent Residential Certificate (PRC) holders should produce the original PRC issued by the Deputy Commissioner or any other duly authorized Revenue Officer of the concerned District of the State for verification at the time of counseling/admission. The certificate should bear the office seal, signature with date, name, and seal of the issuing officer.

(c) ST/SC/OBC certificate should be issued by the competent authority of the concerned District of the State in the prescribed format. The same should be presented in original for verification at the time of counseling/admission by those applicants who have applied for seats under such categories.

(d) OBC candidates shall be required to produce Non-Creamy Layer (NCL) Certificate along with OBC certificate from the Competent Authority. The NCL Certificate must have a validity of one year up to the date of admission in the Institute.

(e)Other (Non-PRC) certificate: If an applicant seeks a seat under State-quota of any of the eight North Eastern States for being a Non-PRC holder, he/she should produce the relevant certificate in original issued by the competent authority of the concerned District of the State to produce the same at the time of counseling/admission.

(f) Govt. Employee Certificate (GEC) issued by the Employer of the applicant's parent/legal guardian should be presented in original for verification at the time of counseling/admission by those applicants who have applied for seats under this option.

***Note**: Providing incomplete / incorrect information will result in cancellation of the applicant's candidature. In case of any dispute, the decision of the Director, NERIST and the Chairman, NEE, shall be final, and no claim or request in this regard shall be entertained at any stage.*

21. Online Anti-Ragging Undertaking/Affidavit is Mandatory for all students

Ragging is banned in the Institute. Anyone, who is found indulging in ragging directly or indirectly during the entire period of his/her study, will be punished as per the institute bye-laws. The punishment may include actions under penal laws, expulsion from the Institute, and suspension from the Institute or fine with a public apology. It may also take the shape of :

(i) Withholding his/her results,
(ii) Withholding his/her scholarships or other benefits,
(iii) Suspension or expulsion from hostel or mess or collective punishment, and/or
(iv) Mentioning the act of indulgence in ragging in his/her Conduct certificates, etc.

Admitted students and parents are required to fill online the anti-ragging undertaking on either of the following websites (www.AMANMOVEMENT.org or www.ANTIRAGGING.in and the hard copy of the undertaking, as received by email,should be submitted to the Academic Section and Nodal Officer, Anti Raggingat the time of semester registration in the month of July every year

22. S Y L L A B I : NEE-I

(Syllabi for Class 10 / Matriculation certificate holder applicants seeking admission in Base Module in Engineering & Technology).

Full Marks: 150 Time: 3 Hours.

SECTIONS:

Section-A Physics	35 Marks.
Section-B Chemistry	35 Marks.
Section-C Mathematics	80 Marks.

Section-A PHYSICS 35 Marks.

Measurement in Science and Technology: Measurements and measurement systems; Historical developments in measurement science; The modern measurement system; The international system of units (SI); Maintenance of standards of measurements; Multiples and fractions; Indian national standards of measurements.

Structure of Atom: Fundamental Experiments and discharge tube and the discovery of the electron; Canal rays or positive rays; X-rays and radioactivity; Atomic nucleus; Structure of atom; Discovery of the neutron; Atomic Number and atomic mass; isotopes.

Motion: Motion of living and non-living objects; Distance and displacement; Uniform and Non Uniform motion, Velocity; Non uniform motion and acceleration; Graphs and their uses; Uniform circular motion.

Gravitation: Universal law of gravitation; Motion of particles under gravity; Motion of a projectile, Mass and weight; Geotropism.

Work, Energy and Power: Work, work done when the force is not along the direction of motion; Energy; Power, Transformation of energy, Conservation of energy.

Heat: Heat and temperature; Thermal equilibrium; Mercury thermometer, Heat as a form of energy, Effects of Heat; Changes of state.

Wave motion and sound : Simple Pendulum, Wave motion; Transverse and longitudinal waves; Graphical representation of simple harmonic waves characteristic of harmonic waves; Relation between wave velocity, frequency and wave length for a periodic ; Nature and propagation of sound; speed of sound; Range of hearing in humans, Reflection of sound, practical applications of reflected sound; Echoes; Sonar and Application of Ultrasound.

Light reflection and refraction: Nature of light; reflection of light by mirrors-by plane mirror, spherical mirrors, new Cartesian sign convention for reflection by spherical mirrors and derivation of mirror formula, magnification; Refraction of light-the refractive Index, reflection through a rectangular glass slab, refraction by spherical lenses, sign convention with spherical lenses - Lens formula, power of a lens, total internal reflection, some optical phenomena in nature; dispersion of white light by a glass prism; color of objects-primary colours of light and pigments.

Optical Instruments: The human eye; defects of vision and their correction; microscope and the astronomical telescope.

Electricity, its heating and chemical effects: Electric charges and its properties; conductors and Insulators; electric current-charges in motion; electric potential and potential difference; circuit diagram; Ohms law-resistance, resistivity, resistors in series and in parallel; heating effect of electric current-electric energy and electric power.

Magnetic effects of electric current: Magnetic field and field lines; magnetic field around a current carrying straight conductor; force on a current-carrying conductor in a magnetic field; electric motors; electromagnetic induction; electric generators; domestic electric circuits; the electric fuse-A safety device.

Nuclear Fission and Fusion: Nuclear reactions; Nuclear fission; Fission products; Energy released in fission reactions; Chain reaction; Theory of Nuclear fission; Nuclear reactors; Nuclear hazards and safety measures.

The Universe: The solar system- the sun, the terrestrial planets, the Jovian planets, asteroids, meteorites and comets. The Structure and evolution of the earth; The stars and constellations; Milky way galaxy and other galaxies; Space exploration-Space Programme in India.

SECTION-B CHEMISTRY 35 Marks

Matter Around Us: Physical nature of matter, states of matter; General concept about mixture, solution, colloidal solution, suspension, distillation, condensation, evaporation, sublimation and fusion; Effect of pressure and temperature on states of matter.

Atomic Structure: Dalton's atomic theory, elements, compounds, cathode ray, X-ray, Thomson's model of an atom, Rutherford's model of atomic structure. Bohr's model of atomic structure. Electronic configuration (in terms of Shells only) of elements up to Atomic No. 20; Atomic number, Mass number, Isotopes and Isobars; Radioactivity.

Classification of Elements: Mendeleev and Modern periodic table, Periodic trend of metallic and nonmetallic character, atomic size, nature of bonding, oxides and related chemical properties, prediction of properties of an atom.

Chemical Bonding: Octet rule or inert gas configuration as criteria of stability. Ion, atom and valency. Ionic bonds, covalent bonds (in simple cases), shape of Molecules of H_2O NH_3, CH_4 $CC1_4$, C_2H_2, C_2H_4 SF_6, PCI_5, CO_2 $BeCl_2$ BF_3

Chemical reactions and Some basic concepts: Decomposition, Displacement reactions, Isomerization, Combination, Reversible and Irreversible reactions, Chemical equilibrium, Law of chemical equilibrium, chemical formula and equations, Atomic and Molecular masses, Mole concept, gram atomic mass and gram molecular mass, Mole concept, gram atomic mass and gram molecular mass, Determination of formula of unknown compounds, Balancing of chemical reactions.

Energetics: Bond energy, Energy involved in a reaction. Photo-chemical reactions and generation of free radicals. Electrolysis of water and NaC1, Electrochemical cells (Galvanic cell) with reference to dry cells and storage cells. Sun and Nuclear energy, Sun and its source of energy (Nuclear fusion), Nuclear fission, Chain reaction, Nuclear reactors, Nuclear hazards, simple nuclear reactions.

Metals: Physical and chemical properties, Reaction with O_2, dilute acid, $C1_2$. Elementary metallurgy of Cu, Fe, Al, and uses of the metals. Washing soda, Baking soda, lime, preparation of Bleaching Powder, Plaster of Paris, Cement, Glass, Steel. Some common alloys of copper, iron and aluminum. Corrosion of metals.

Non-Metals: Physical and chemical properties, reactions with O_2, acid, $C1_2$, H_2, Preparation and properties of Si, P, S, ammonia, hydrogen and sulphuric acid. Carbon and its compounds: Allotropes of carbon. Hydrocarbon: Alkanes, Isomerism in alkanes. Petroleum; Preparation and properties of Methanol, Ethanol, Methanal, Propanone, General properties of organic acids and esters, Synthetic polymers: addition polymers (PE, PP, PVC, Teflon) and condensation polymers (nylons and polyesters); Rubber and its vulcanization; Soaps, detergents; Cleansing action of soaps and detergents.

Bio-mass as fuel: Fossil fuel, Coal, Petroleum, Natural gas; Classification of Fuels. Calorific value of fuels, Ignition temperature, Combustion of fuels, Characteristics of an ideal fuel.

Environmental Pollution: Types of pollution and pollutants, Acid rain, Green House Effect, Eutrophication and Soil erosion. Conservation and protection of environment.

SECTION – C MATHEMATICS 80 Marks

Algebra:

Number System: Whole numbers, Integers, Rational and Irrational numbers, Surds and rationalization of surds, Real numbers

Polynomials: Definition of a polynomial, Factorization of polynomials Factorization of quadratic and cubic expressions, HCF and LCM of polynomials.

Rational Expressions: Addition, Multiplication and Division of rational expressions

Linear Equations in one & two variables: Solution of Linear equations in one and two variables by cross multiplication and other simple methods; Application to practical problems.

Quadratic Equations: Zeros of quadratic equations, Solution of quadratic equations by (i) factorization (ii) method of completion of square: quadratic formula, Application quadratic equations.

Arithmetic Progression (AP): Definition, nth term of an A.P. , Sum of finite number of terms an A.P.

Geometry:

Lines, Angles and Triangles: Geometrical concepts of a point, Angle and a triangle, Angles made by a transversal with two lines, Sum of the angles of a triangle, Different criteria for congruence of two triangles, Properties of Isosceles triangle, Similar triangles, Proportionality theorems, Concurrent Lines in a triangle. **Parallelograms:** Definition, Properties of a parallelogram, Types of parallelograms, some theorems on parallelograms.

Circles: Definition, congruence of circles, chords of a circle Arcs of a circle, Angles subtended by Arcs and chords at a point on a circle, angles in a cyclic quadrilateral, Tangents to a circle, Properties of tangents to a circle, Chord of a circle intersecting in a point, Alternate segments and its angles, Common tangents to circles.

Trigonometry: Trigonometric ratios of angles of measures $0^{0,}$ 30^{0}, 45^{0},60^{0},90^{0}. Trigonometric ratios of some specific angles, solution of right triangles; Trigonometric ratios of complementary angles; Simple problems on heights and distances, Angles of elevation and depressions

Mensuration: Area of a triangle, quadrilateral, Circle, sector and segment of a circle, Trapezium, Concept of perimeter of these figures. Lateral and total surface area of right triangular prisms, volume of a right triangular prism. Lateral surface area and volume of a right pyramid, surface Area and volume of a tetrahedron, Lateral and total surface area and volume of a cuboid, cube, right circular cylinder, right circular cone hemisphere and surface area and volume of a sphere, surface area and volumes of combinations of these solids, volume and surface are of a frustum of a right circle cone

Statistics and Probability: Mean, Median Mode and their properties, Measures of central tendency, Probability as a measure of uncertainty.

Coordinate Geometry (2D): Distance between two points, section formula between two points.

23. S Y L L A B I : NEE-II (PCM / PCB)

(Syllabi for 10+2 PCM and 10+2 PCB applicants seeking admission in Diploma Module in Engineering & Technology and Degree Module in Forestry, respectively).

Full Marks : 150 Time: 3 Hours

SECTIONS :

Section-A	Physics	45 marks. (Common for 10+2 PCM as well as PCB Candidates)
Section-B	Chemistry	45 marks. (Common for 10+2 PCM as well as PCB Candidates)
Section-C	Mathematics	60 marks. (for 10+2 PCM Candidates)
Section-C	Biology	60 marks. (for 10+2 PCB Candidates)

Section-A PHYSICS 45 marks.

Physical World and Measurement: Physics scope and excitement, physics, technology and society, Forces in nature, Conservation laws, Examples of Gravitational, electromagnetic and Nuclear forces from daily-life experiences (qualitative only). Need for measurement, Units of measurement, systems of units, SI units, Fundamental and derived units, length, mass and time measurement, Accuracy and precision of measuring instruments. Errors in measurement, significant figures. Dimensions of Physical quantities. Dimensional analysis and application. Elementary concept of differentiation and integration for describing motion.

Kinematics: Uniform motion in a straight line, Position time graph, speed and velocity, Uniform and non-uniform motion, average speed and instantaneous velocity . Uniformly accelerated motion, velocity time graph, relations for uniformly accelerated motion (Graphical method). Scalar and vector quantities, position and displacement vectors, Equality of vectors, multiplications of vectors by real number, Addition and subtraction of vectors, Unit vector, Resolution of a vector in a plane. Rectangular components, Scalar and Vector products of two vectors, vectors in 3 dimensions (elementary idea only) Motion in a plane, Uniform velocity and uniform acceleration, projectile motion, uniform circular motion.

Laws of Motion: Force and inertia, Newton's first law of motion, Momentum, Newton's second law of motion, Impulse , Newton's third law of motion, conservation law of linear momentum and its application, Equilibrium of concurrent forces, Friction, static and dynamic friction, laws of friction, rolling and sliding friction, lubrication. Dynamics of uniform circular motion, centripetal force, Vehicle on a level road, Vehicle on a banked road. Inertial and non-inertial frames (Idea only).

Work, Energy and Power: Work done by a constant force and variable force, kinetic energy, Potential energy, work-energy theorem, power. Potential energy of a spring, conservative and non-conservative forces, conservation of mechanical energy (kinetic and potential energies), collisions, Elastic and inelastic collision in 1 dimension and 2 dimensions. Different forms of Energies in nature, Mass-Energy equivalence (Qualitative Idea).

Motion of system of particles and Rigid Body: Centre of mass of two particle system, generalization to N-particles, momentum conservation and center of mass motion, Application to familiar systems, Centre of mass of a rigid body.

Gravitation : The universal law of Gravitation, Gravitational constant, Acceleration due to gravity and its variation with altitude, latitude, depth and rotation of earth, Mass of the earth, Gravitational potential energy near the surface of earth, gravitational potential, Escape Velocity. Orbital Velocity of a Satellite. Weightlessness, Motion of Satellites, geostationary and polar satellites, Kepler's laws of planetary motion. Proof of second and third law, (for circular orbit) Inertial and gravitational mass. Moment of force, torque, angular momentum, Physical meaning of angular momentum, conservation of angular momentum with some examples (Planetary motion). Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion. Moment of Inertia & its physical significance, radius of gyration, parallel and perpendicular axis theorem (statement only) M.I. of circular ring, disc,

cylinder and thin straight rod. Rolling of a cylinder without slipping. Examples of binary system in nature (Binary Stars, Earth-moon system, diatomic molecules).

Mechanics of Solids and Fluids: States of matter, inter atomic and inter molecular forces.

a**) Solids :** Elastic behavior, stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity & some practical examples.

b)**Fluids:** Pressure due to fluid column, Pascal's law and its application (hydraulic lift and brakes) Effect of gravity on fluid pressure . Buoyancy, flotation, and Archimedes principle, Viscosity, Stoke's law, terminal velocity, stream line flow, trubulent flow. Reynold's number. Bernoulli's theorem and its applications.

c) Surface energy and surface tension, angle of contact, application of surface tension, excess pressure inside a liquid drop and bubble, capillary rise and action of detergent.

Heat and Thermodynamics: Kinetic theory of gases-assumptions, concept of pressure, kinetic energy and temperature, r.m.s. speed, degree of freedom, law of equipartition of energy (statement only), mean free path and Avogadro's number.

Thermal equilibrium and temperature (Zeroth law of thermodynamics) Heat, work and internal energy, thermal expansion-thermometry. First law of thermodynamics, specific heat, specific heat of gas at constant volume and pressure (mono atomic, diatomic gases). Specific heat of solids (Dulong and Petits' law).

Thermodynamic variables and equation of state, phase diagram; ideal gas equation, isothermal and adiabatic processes, reversible and irreversible processes carnot's engine and refrigerator or heat pump. Efficiency and co-efficient of performance, second law of thermodynamics (statement only); and some practical applications.

Transfer of heat-Conduction, convection and radiation. Thermal conductivity of solids, Black body radiation, Kirchhoff's laws, Wein's displacement law, Stefan's law (statement only) Newton's law of cooling, solar constant and determination of surface temperature of sun using Stefan's law.

Oscillations: Periodic motion- period, frequency, displacement as a function of time and periodic functions. Simple Harmonic Motion (SHM) and its equation, Expression for velocity and acceleration of SHM. Oscillations of a spring, restoring force and force constant, Energy in SHM-Kinetic and potential energies, Simple pendulum- derivation of its time period, Free, forced and damped oscillations (qualitative idea only), resonance, coupled oscillations.

Waves: Longitudinal and transverse wave, wave motion, Displacement relation for progressive wave. Principle of superposition of waves, Reflection of waves, Standing waves in strings and pipes, fundamental and higher harmonics, Beats, Doppler's effect, speed of sound in media.

Electrostatics: Frictional electricity, charges and their conservation, coulomb's law, Forces between two point electric charges. Forces between multiple electric charges; Superposition principle and continuous charge distribution. Electric fields and its physical significance, electric field due to a point charge, electric field lines, electric field due to a dipole and behavior of a dipole in a uniform electric field. Electric potential-physical meaning, potential difference, electric potential due to a point charge, a dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly changed infinite plane sheet and uniformly charged thin spherical shell. Conductors and insulators, presence of free charges and bound charges inside a conductor, Dielectrics and electric polarization, general concept of a capacitor and capacitance : Combination of capacitors in series and parallel, energy stored in a capacitor, capacitance of a parallel plate capacitor with and without dielectric medium between the plates; Van de Graff generator.

Current Electricity: Electric current, flow of electric charge in a metallic conductor, drift velocity and mobility and their relation with electric current, ohm's law, electrical resistance, V-I characteristics, Exception, of ohm's law (Non-linear V-I characteristics), Electrical resistivity and conductivity, classification of materials in terms of conductivity; Superconductivity (elementary idea); Carbon resistors, colour code for carbon resistors, combination of resistances- series and parallel.

Temperature dependence of resistance, Internal resistance of a cell, Potential difference and e.m.f. of a cell, combinations of cells in series and in parallel. Kirchhoff's laws - illustration by simple application. Wheatstone bridge and its Applications for temperature Measurements. Metre bridge-

special case of whetstone's bridge. Potentiometer- principle and application to measure potential difference, and for comparing e.m.f. of two cells.

Electric power, thermal effects of current and Joule's law, Chemical Effects of Current: Faraday's laws of electrolysis; Electrochemical Cells- Primary (Voltaic Lechlanche, Dry Daniel,) and secondary- rechargeable cells (lead accumulators, alkali accumulators) solid state cells. Thermoelectricity- origin, elementary idea of See beck effect; Thermocouple. Thermoe.m.f. neutral and inversion temperatures. Measurement of temperature using a thermocouple.

Magnetic effects of current & magnetism: Concept of magnetic field, Oersted's experiment, Biot-Savart law, magnetic field due to an infinitely long current carrying straight wire and a circular loop: Ampere's circuital law and its application to straight and toroidal solenoids; Force on a moving charge in uniform magnetic and electric fields, cyclotron; Force on a current carrying conductor in a uniform magnetic field, Forces between two parallel current- carrying conductors, definition of ampere. Torque experienced by a current loop in a uniform magnetic field, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment, magnetic dipole moment of a revolving electron, Magnetic field intensity due to magnetic dipole (bar magnet) along the axis and perpendicular to the axis; Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; Bar magnet as an equivalent solenoid, Magnetic field lines. Earth's magnetic fields and magnetic elements : Para, dia and ferromagnetic substances with examples. Electromagnets and permanent magnets.

Electromagnetic Induction & Alternating currents: Electromagnetic Induction, Faraday's Laws, Induced e.m.f. and current, Lenz's law, Eddy currents, Self and mutual inductance. Alternating currents peak and r.m.s. values of Altemating current/voltage, reactance and impedance; LC oscillations, LCR series circuit (Phasor diagram) Resonant circuits and Q-factor, Power in AC circuits, Wattless current. AC generator and transformer.

Electromagnetic Waves: Electromagnetic waves and their characteristics (qualitative idea only); Transverse nature of electromagnetic waves.

Electromagnetic spectrum (Radio-microwaves, infrared, optical, Ultraviolet, gamma rays) including elementary facts about their uses, Propagation of electromagnetic waves in atmosphere.

Optics : Refraction of light, total internal reflection and its application, spherical lenses, thin lens formula, lens maker's formula; Magnification, Power of a lens, combination of this lenses in contact; Refraction and dispersion of light due to a prism, Scattering of light. Blue colour of the sky and reddish appearance of the sun at sun-rise and sun set.

Optical Instruments – Compound Microscope, astronomical telescope (refraction and reflection type) and their magnifying powers.

Wave front and Huygens's principle; Reflection and refraction of plane wave at a plane surface using wave fronts (qualitative idea); Interference- Young's double slit experiment and expression for fringe width, Coherent sources and sustained interference of light; Diffraction due to a single slit, width of central maximum, difference between interference and diffraction.

Resolving power of microscope and telescope, Polarization-plane polarized light, Brewster's Law, Use of plane polarized light and Polaroid.

Dual Nature of Matter and Radiation: Photo-Electric effect, Einstein's Photo-electric equation, Particle nature of light, Photo Cell, Matter waves, Wave nature of particles, De-Broglie relation, de Broglie wave length of an electron. Davisson-Germer Experiment.

Atomic Nucleus: Alpha-particle scattering experiment, size of the nucleus, composition of the nucleus, protons and neutrons, Nuclear instability- Radioactivity-Alpha, Beta and Gamma particles/rays and their properties, radioactive decay law, simple explanation of decay, beta- decay and gamma-decay. Mass-energy relation, mass defect, binding energy per nucleon, its variation with mass number. Nature of nuclear forces, nuclear reaction, Nuclear fission and Nuclear fusion.

Solid and Semi-conductor Devices: Energy bands in solids (qualitative idea only), difference between metals, insulators and semiconductors using band theory; intrinsic and extrinsic semi-conductors, p-n junction, semi-conductor diode-characteristics in forward and reverse bias, diode as a rectifier, solar cell, photodiode. LED, Zener diode as a voltage regulator, Junction transistor, transistor action, characteristics of a transistor. Transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR,AND,NOT,NAND and NOR); Elementary ideas about IC.

SECTION-B CHEMISTRY 45 marks

Some Basic concepts of chemistry: Nature of matter, properties of matter and their measurements, Law of Chemical combination, Dalton's Atomic Theory, Atomic and molecular masses, Mole concept, Stoichiometry and stoichiometric calculations.

Structure of Atoms and Chemical Bonding: Constituent of the atom, electronic structure of atom, understanding electron behavior, Bohr's model of hydrogen and hydrogen like atoms, spectrum of hydrogen, Dual behavior of matter, de Broglie equation, Heisenberg's uncertainty principle; Quantum numbers, shapes of orbital, Aufbau principle, Pauli's exclusion principle, Hund's rule of maximum multiplicity; Electronic configuration of elements up to atomic numbers 30. Chemical bonding: Lewis structure, Hybridization and VSEPR theory with reference to $BeC1_2$, BF_3, CH_4, $CC1_4$, NH_3, H_2O, NH_4^+, H_3O^+, PCl_5, SF_6, C_2H_4 and C_2H_2. Molecular orbital theory with reference to simple homodiatomic molecules up to atomic number 10. Hydrogen bond. Dipole moment in simple molecules.

States of Matter: The gaseous state: Kinetic molecular theory of ideal gases. Laws governing the ideal behavior of gases, deviation from the ideal behavior; van der Waals equation of state for real gases. Concept of critical constants, Liquefaction of gases.

Solid State: Structure of simple ionic compounds, Close–packed structure, ionic radii; Silicates, Imperfections in solids, properties of crystalline solids and amorphous solids.

Solutions: Types of solution, Vapor pressure of solution and Raoult's law, Ideal and non-ideal solutions. Colligative properties, Abnormal molecular masses.

Chemical Thermodynamics: Some basic concepts; Energy changes during a chemical reaction, Internal energy and Enthalpy. Enthalpy of reaction, First law of thermodynamics, Concept of Entropy and Free energy, Spontaneity of a process, Second and Third law of thermodynamics.

Chemical Equilibrium: Equilibria involving physical changes and chemical systems, Law of Mass action and its application to equilibrium. Le-Chatelier's principle and its applications. Ionic Equilibria; Ostwald's dilution law; Arrhenius, Bronsted-Lowry and Lewis concept of acids and bases. pH scale, Buffer solutions and Solubility product.

Chemical Kinetics: Rate of reaction, Instantaneous rate of a reaction, Molecularity and order of a reaction, Factors affecting the rate of a reaction, Elementary and complex reactions, Determination of the order of a reaction, Dependence of reaction rate on temperature and catalyst, Photochemical reactions, Mechanism of a reaction.

Surface Chemistry: Adsorption, Colloidal solutions, Emulsions. Homogeneous and heterogeneous catalysis.

Redox Reactions: Oxidation and reduction as an electron transfer process, Oxidation number, balancing of redox equations.

Electrochemistry: Electrolytic conductance, Equivalent and molar conductivities, Galvanic cell, Electrode potential and EMF of a Galvanic cell, Dependence of EMF on concentration and temperature Electrochemical cell and free energy, Electrolysis, Quantitative aspect of electrolysis, Faraday's Laws, and Criteria for product formation; Some commercial batteries, Corrosion.

s-Block Elements: General trends , characteristics of compounds of Alkali and Alkaline earth metals. Anomalous behaviour of Lithium and Beryllium. Some important compounds of Sodium and Calcium. Chemistry of Hydrogen, Water and Hydrogen peroxide.

p-Block Elements: General trends. Anomalous behaviour of Boron and Carbon. Allotropy: Different allotropes of Carbon, Sulphur, Phosphorus, and Tin. Chemistry of some important compounds of Boron, Carbon, Silicon, Nitrogen, Phosphorus, Oxygen, Sulphur, and Halogens. Characteristics of Group-18 elements, and Chemistry of Xenon. Metallurgy of Aluminium.

d- & f-Block Elements: General trends, Characteristic properties of transition and inner transition elements. General properties of first row transition metal compounds. Metallurgy of Iron and Copper. Manufacture of steel, Chemistry of some heavy metals like Silver, Gold, Zinc, Mercury, and Compounds such as Potassium permanganate and Potassium dichromate.

Co-ordination and Organo-metallic Compounds: Co-ordination compounds, Isomerism and bonding in co-ordination compounds; Stability of co-ordination compounds in solution; Importance of co-ordination compounds. Organo-metallic compounds.

Organic Chemistry: Classification and nomenclature of organic compounds, Isomerism and stereochemistry. Fundamental concepts in organic reaction mechanism, Methods of purification; Qualitative and quantitative analysis of organic compounds; Modern methods of structure elucidation.

Hydrocarbons: Preparation and properties of alkanes, alkenes and alkynes; Aromatic hydrocarbons, aromaticity. Preparation, properties and structure of Benzene.

Organic compounds with functional group**:** General methods of preparation, physical and chemical properties and important uses of haloalkanes, haloarenes, polyhalogen compounds, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and derivatives of carboxylic acids, cyanides, isocyanides, amines, nitro and azo compounds.

Polymers**:** Nomenclature and classification of polymers, Types of polymerization, Molecular mass of polymers; Some commercially important polymers.

Bio-molecules**:** Structure and function of carbohydrates, proteins, nucleic acids, lipids and vitamins.

Nuclear Chemistry**:** Discovery of radioactivity and nature of radiation from radio active substances; Chemical equations for nuclear changes, Radioactive series, Rate of radioactive decay, Artificial transmutation radioactivity, Synthetic elements, Nuclear fission, Nuclear fusion. Applications of radioactivity and radio-isotopes.

Chemistry in Everyday life: Dyes, Chemicals in medicines, Chemistry of rocket propellants, Chemicals in food, Soaps and Detergents.

SECTION-C MATHEMATICS (for PCM Candidates) 60 marks

Algebra:

Sets: Sets and their representations, finite and infinite sets, subsets, empty or null set, universal set, equal sets, power set and complement of a set, union and intersection of sets and their algebraic properties, difference of sets, Venn diagrams, application of sets.

Relations and functions: ordered pairs, Cartesian product of sets, relations, domain, co-domain and range, into and onto functions, one one into and one one onto functions, constant function, identity function, composition of functions, invertible functions, Binary operations.

Complex Numbers: Complex number in the form (a+ib), representation of complex numbers by points in plane, Argand diagram, algebra of complex numbers, real and imaginary parts of a complex number, triangle inequality, modulus and argument (or amplitude) of a complex number, conjugate, square root of a complex number, cube root of unity, polar representation of a complex number.

Theory of quadratic equation: Solution of a quadratic equation in the complex number system by (i) factorization (ii) using formula, relation between roots & coefficients, the nature of roots, formation of quadratic equations with given roots, Symmetric functions of roots, Equations reducible to quadratic forms.

Sequences and series: Sequence and examples of finite and infinite sequences, Arithmetic progression (A.P.)- first term, common difference and nth term, sum to n terms of an A.P., Arithmetic mean (A.M.), insertion of A.M. between any two given numbers, Geometric progression (G.P.)-first term, common ratio and nth term, Sum to n terms and infinite number of terms of a G.P., recurring decimal numbers as G.P., Geometric Mean (G.M.) insertion of G.M. between any two given numbers, Harmonic progression, Harmonic mean(H.M),relationship among A.M., G.M. and H.M, arithmetico-geometric series, special cases of $\sum n, \sum n^2, \sum n^3$, exponential series concept of e as the sum of an infinite series, proof of $2<e<3$, exponential function (e^x) as the infinite series, logarithmic series- infinite series for $\log_e(1+x)$, $\log_e(1-x)$ and related problems.

Permutations and combinations: Fundamental principle of counting, the factorial notation, Permutation as an arrangement, meaning of P (n,r), combination, meaning of C(n,r) ,application of permutations & combinations.

Mathematical Induction: The principle of mathematical Induction, simple applications.

Binomial theorems**:** Statement of binomial theorem, proof of the binomial theorem for positive integral exponent using the principle of mathematical induction, general and middle terms in binomial expansions, Binomial theorem for any index (without proof), application of binomial theorem for approximation and properties of binomial coefficients.

Mathematical logic: Mathematical Logic statement, Venn diagrams, negation, basic logical connectives and compound statement including the negations, truth tables, duality algebra of statements and applications of logic in solving simple problems. Matrices and determinants: Types of matrices, Equality of matrices, operations of addition, scalar multiplication and multiplication of matrices, statements of important results on operations of matrices and their verification by numerical problems only, linear equations in matrix notation, determinants, determinant of a square matrix, properties of determinants, minors & cofactors of determinants, applications of determinants in (i) finding area of a triangle (ii) Solving a system of linear equations, Cramer's rule, transpose, adjoint and inverse of a matrix, consistency and inconsistency of system of linear equations, application of matrices in solving simultaneous linear equations in two or three variables.

Boolean Algebra: Boolean algebra as an algebraic structure, principle of duality, Boolean function, conditional and biconditional statements, valid arguments, switching circuits, application of Boolean algebra to switching circuits.

Trigonometry:

Trigonometric functions of sum and difference of numbers, Trigonometric functions of multiples and submultiples of numbers, conditional identities for the angles of a triangle, Solution of trigonometric equations, solution of triangles, concept of inverse trigonometric functions and their use to reduce expression to simplest form.

Vectors: Vectors & scalars, Magnitude and direction of a vector, types of vectors, position vector of a point dividing a line segment in a given ratio, components of a vector, addition of vectors, multiplication of a vector by a scalar, scalar (dot) product of vectors, projection of a vector on a line, Vector (cross) product of two vectors, application of dot & cross products in (i) finding area of a triangle and a parallelogram (ii) problems of plane geometry and trigonometry (iii) finding work done by a force (iv) vector moment of a vector about a point, scalar triple product and its applications, Moment of a vector about a line, co planarity of three vectors or four points using scalar triple product, vector triple product .

Coordinate Geometry: Two Dimension**:** (i) Area of a triangle, condition for the collinearity of three points, centroid and in-centre of a triangle, locus and its equation.

The straight line and pair of straightlines –Various forms of equations of a line, intersection of lines, angles between two lines, condition for concurrency of three lines, distance of a point from a line, coordinates of orthocentre and Circumcentre of a triangle, equation of family of lines passing through the point of inter- section of two lines, homogeneous equation of second degree in x & y , angle between pair of lines through the origin, combined equation of the bisectors of the angles between a pair of lines, condition for the general second degree equation to represent a pair of lines, point of inter-section and angle between two lines represented by S=0 and the factors of S.

Circles: Standard form of the equation of a circle, general form of the equation of a circle, its radius and center, equation of a circle in the parametric form, equation of a circle when the end points of a diameter are given, points of inter- section of a line and a circle in the center at the origin and condition of a line to be tangent to the circle, length of tangent, equation of the tangent, equation of a family of circles through the inter- section of two circles, condition for two inter- secting circles to be orthogonal.

Conic sections- Sections of cones, equations of conic sections (parabola, ellipse, hyperbola) in standard forms, conditions for $y=mx+c$ to be a tangent and points of tangency.

Geometry of Three Dimension (3D): Coordinate axes, planes in three dimensional space, coordinates of a point in space, distance between two points, section formula, d.c'.s. and d.r'.s. of a line joining two points, projection of the join of two points on a given line, angle between two lines whose d.r'.s. are given, Cartesian and vector equation of a line through (i) a point and parallel to a

given vector (ii) through two points, co- linearity of three points, coplanar & skew line, shortest distance between two lines, condition for the intersection of two lines, Cartesian & vector equation of a plane (i) when the normal vector and the distance of the plane from the origin is given (ii) passing through a point and perpendicular to given vector (iii) passing through a point and parallel to two given lines through the intersection of two other planes (iv) Containing two lines(v) Passing through three points, Angle between two lines (ii) two planes (iii) a line and a plane. Condition of co-planarity of two lines in vector and Cartesian form, Length of perpendicular of a point from a plane by both vector and Cartesian methods, vector and Cartesian equation of a sphere, its center and radius, diameter form of the equation of a sphere.

Calculus: Function, Limits and Continuity: Concept of real function, its domain and range, types of functions, limit of a function, meaning and related notations, left and right hand limits, fundamental theorems on limits, limit at infinity and infinite limits, continuity of a function (i) at a point (ii) over an open/closed intervals, Sum, product and quotient of continuous functions, continuity of special functions-polynomial, trigonometric, exponential, logarithmic, inverse trigonometric functions.

Differentiation: Derivative of a function, its geometrical and physical significance, Relationship between continuity and differentiability, derivative of some simple functions from first principle, derivative of sum, difference, product and quotient of functions, derivative of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, derivative of functions expressed in parametric form, chain rule and differentiation by substitution, Derivatives of second order.

Application of Derivatives: Rate of change of quantities, tangents and normals, increasing and decreasing functions and sign of the derivatives, maxima & minima, greatest and least values, Rolle's theorem and mean value theorem (without proof), curve sketching of simple curves.

Indefinite integrals: Integration as inverse of differentiation, properties of integrals, integration by substitution, by parts, partial fractions and their use in integration, integration of rational and irrational functions, integration of trigonometric functions of the type $\int \frac{dx}{a+b\cos x'} \int \frac{dx}{a+b\sin x} and \int \sin^m x \cos^n x dx.$

Definite Integrals: Definite integral as limit of a sum, fundamental theorems of integral calculus (without proof), evaluation of definite integrals by (i) substitution (ii) using properties of definite integrals , application of definite internals in finding the areas bounded by a curve, circle, parabola and ellipse in- standard form between two ordinates and x-axis , area between two curves (line and circle, line & parabola, line & ellipse).

Differential Equations: Definition, order and degree, general and particular solution, formation of a differential equation whose general solution is given, solution of differential equation by the method of separation of variables, homogeneous differential equations, linear differential equation of the type $\frac{dy}{dx} + py = Q(\mathrm{x})$ whose $p(x) \& Q(x)$ are functions of x, Solution of second order differential equations.

Statics and Dynamics**:** Elementary Statics- Introduction, basic concepts, laws of mechanics, force, resultant of forces acting at point, parallelogram Law of forces, resolved parts of a force, equilibrium of a particle under three concurrent forces, triangle law of forces and its converse, Lami's theorem and its converse, two parallel forces, Like and unlike parallel forces, couple and its moment.

Elementary Dynamics: Basic concept. like displacement, speed, velocity, average speed, instantaneous speed, acceleration and retardation, resultant of two velocities, Motion of a particle along a line when moving with constant acceleration, motion of a particle under gravity, projectile motion, the path of a projectile, its horizontal range, velocity at any instant, greatest height and time of flight.

Probability: Random experiment and associated sample space events as subsets of sample space, occurrence of an event, impossible events, sure events, combination of events through the operations "and", "or", "not" and their set representation, meaning of equally likely outcomes, definition of probability of an event as the ratio of the number of favorable equally likely outcomes to the total number of outcomes, equally likely events, addition rule for mutually exclusive events, Conditional probability, independent-events, independent experiments, Calculation of probability of events

associated with the independent experiments P (A or B), P (A and B) , Baye's theorem and its application, recall of concept of random variables and its probability distribution, mean and variance of random variables, Binomial and Poisson's distributions, their mean, variance and application of these distributions in commerce and industry.

SECTION-C BIOLOGY (For PCB Candidates) 60 Marks

Origin and Evolution of life: Theories and evidences of origin of life, Concept of species, speciation and isolation; Homeostasis; Scope of biology; Classification-artificial, natural and phylogenetic; Binomial nomenclature; Status of bacteria and virus.

Cell biology : Ulta structure of cell; cell organelles and their function; Cell division; Karyotype analysis; Chromosomal basis and other patterns of inheritance; Linkages and crossing over; Mutation and chromosomal aberrations; Gene mapping; Human genetics; Structure of RNA and its role in protein synthesis; Gene expression and its regulation; Nuclear basis of differentiation and development; Oncogenes; DNA as a genetic material; Recombinant DNA technology; Gene bank; DNA fingerprinting; Genomics-principles and applications; Transgenic plants, animals and microbes.

Physiology of plants and animals: Plant water relations; Transpiration; Photosynthesis; Respiration, glycolysis, Kreb's cycle, compensation point, Respiratory Quotient; Food and Vitamins; Inter- and intra-cellular digestion; Role of hormones and enzymes in digestion; malnutrition; Respiration and circulation in animals; Blood, its composition and related disorder; Osmoregulation and excretion.

Reproduction and growth in plants and animals: Vegetative, micropropagation and sexual reproduction; Flowering-Photoperiodism, Vernalization; Pollination; Double fertilization; Parthenogenesis and Parthenocarpy; Reproduction in animal-embryonic development, growth, repair, aging and death; Movement and locomotion in plants and animals; Nervous coordination in animal; Phytochromes; seed germination; Role of growth regulators in seed dormancy.

Ecology and Environment: Organism and the environment; Population, community, ecosystem and biosphere; Major biomes; Ecological succession; Productivity; Energy flow in ecosystem; Nutrient cycling; Natural resources and its conservation; Biodiversity; Environmental pollution; Global environmental changes; Environmental ethics and legislation.

Morphology of plants and animals: Morphology and modification of root, stem and leaf; Inflorescence, flower, fruit, seed structure and types; Description of family poaceae, liliaceae, fabacae, solanaceae and asteraceae; Meristematic and permanent tissues; Anatomy of root, stem and leaf; Secondary growth; Animal tissues-structure and function of epithelial, connective, muscular and nervous tissues; Salient features of earthworm, cockroach and rat.

Application of biology: Human population growth and factors; Common problem of drug, Alcohol and tobacco; Mental and addictive disorder; Common human diseases; Technology for medical application; Plant tissue culture and its application; Bioenergy; Biopesticide; Biopiracy; Bioethics; Domestication and improvement of plants and animals; Biomedical technologies such as radiography, angiography, sonography, ECG,EEG,ELISA test; Types, detection and diagnosis of cancer.

24. S Y L L A B I : NEE-II (Vocational)

(For 10+2 vocational / ITI / NERIST Certificate holder applicants seeking admission to Diploma module in Technology stream).

Full Marks : 150 Time: 3 Hours.

SECTIONS :

Section-A	Physics	25 marks.
Section-B	Chemistry	25 marks.
Section-C	Mathematics	30 marks.
Section-D	Vocational Subject	70 marks.

Section-A PHYSICS 25 Marks.

Units and dimensions: Units for measurements, systems of units, fundamental and derived units, SI units. Dimensional analysis and their applications.

Motion in one and two dimensions **:** Objects in motion in one dimension, motion in a straight line, uniform motion, its graphical representation and formulae, speed and velocity, instantaneous velocity, uniformly accelerated motion, its position-time graph, velocity-time graph and formulae.

Vectors and scalars, representations of vectors in two dimensions, unit vector, vector addition and multiplication, Resolution of vectors in plane, rectangular components, Scalar and vector products, Motion in two dimensions, projectile motion, uniform circular motion.

Laws of motion: Force and inertia, first law of motion, Momentum, second law of motion, impulse, Third law of motion, examples of third law, linear momentum, conservation of linear momentum, Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication.

Work, Energy and Power: Work done by a constant force, Kinetic and potential energy, power, Work-energy principle, Spring constant, Gravitational potential energy, Conservation of energy, Elastic collision in one dimension.

Rotational motion: Centre of mass of a two-particle system, centre of mass of a rigid body, general motion of a rigid body, motion of centre of mass, nature of rotational motion, rotational motion of a single particle in two dimensions, Uniform circular motion and their examples, Torque, angular momentum, conservation of angular momentum, Moment of inertia and its physical significance.

Gravitation:Newton's law of gravitation, universal gravitational constant 'G', acceleration due to gravity 'g', mass and density of the earth, inertial and gravitational mass, variations of 'g'. Gravitational potential energy near the earth's surface, gravitational potential, orbital velocity, escape velocity, geostationary satellite.

Properties of matter: Inter atomic and intermolecular forces, states of matter, Elastic properties of solids, Hooke's law, Young's modulus, bulk modulus and modulus of rigidity. Fluid pressure, Pascal's law, buoyancy, flotation, Archimedes' principle, Atmospheric pressure. Surface Energy and Surface Tension, angle of contact, Capillary rise, Viscosity, Stokes law, streamline & Turbulent flow, Reynold's number, Bernoulli's Theorem & its applications.

Heat and thermodynamics: Kinetic theory of gases, pressure exerted by a Gas, kinetic Energy & Temperature, Measurement of temperature, Absolute temperature scale, Gas Laws and Avogadro's number. Specific heat of solids & liquids, Latent heats of fusion &vapourisation , Transfer of heat.

Oscillations and waves: Periodic motion, simple harmonic motion, equation of simple harmonic motion, kinetic and potential energy in simple harmonic motion, Oscillations due to a spring mass system, simple pendulum, time period of a simple pendulum. Wave motion, speed of a wave, principle of superposition, reflection of wave, Standing waves in string (graphical representation only), Sound wave and its propagation in different media, Effect of pressure and temperature on velocity of sound waves, characteristics of sound waves.

Electrostatics: Frictional Electricity, charges and their conservation, Coulomb's law, Electric field and potential due to a point charge, Dipole, its fields along the axis, Concept of dielectric and dielectric constant, Conductors and insulators.

Presence of free charges and bound charges inside a conductor, Capacitance, parallel plate capacitor with air and dielectric medium between the plates, series and parallel combination of capacitors, energy stored in a capacitor, van de graaff generator.

Current electricity: Electric current, Ohm's law, resistivity, resistance of different materials, temperature dependence of resistance, resistances in series and parallel, Kirchhoff's law - illustrations by simple examples, Wheatstone bridge and its applications for comparing emf of two cells and determination of internal resistance of a cell, Electric power and heating effects of current .

Magnetic effect of current: Oersted's experiment, Force on a moving charge in a uniform magnetic field, Force on a current carrying conductor and torque on current loop in a magnetic field, forces between two parallel current carrying conductors, definition of Ampere, Moving coil galvanometer and its conversion into ammeter and voltmeter.

Magnetism:Natural and man made magnets, properties of bar magnet, current loop as magnetic dipole, Lines of force in a magnetic field, Comparison of bar magnet and solenoid, Earth's magnetic field, Tangent galvanometer, vibration magnetometer, Electromagnets and permanent magnets.

Electromagnetic induction and alternating current: Induced emf, Faraday's laws, Lenz's law, electromagnetic induction, self and mutual inductance,

Ray Optics and Optical Instruments : Sources of light, luminous intensity, luminous flux, Reflection of light at plane and spherical surfaces, Curved mirrors, mirror formula. Refraction of light, refractive index, total internal reflection, spherical lenses, thin lens formulae, lens maker's formula, magnification. Refraction and dispersion of light due to prism, spectrometer - its use for the determination of refractive index of material of a prism, Scattering of light in atmosphere, primary rainbow, Optical instruments - simple and compound microscopes, refracting and reflecting telescopes.

Section-B CHEMISTRY 25 Marks.

Structure of Atom: Discovery and properties of sub-atomic particles (electron, proton and neutron), Rutherford's atomic model, Bohr's model of hydrogen and hydrogen-like atoms, Spectrum of hydrogen, Heisenberg's uncertainty principle, Dual nature of electron, de-Broglie equation, Quantum numbers, Concept of atomic orbital, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle, Electronic configuration of elements up to atomic number 20.

Chemical Bonding: Ionic, Covalent, Co-ordinate covalent, Hydrogen and metallic bonds, Properties of compounds having these bonds. Hybridization and VSPER theory for the molecular shape of simple molecules such as $BeC1_2$, BF_3, CH_4, $CC1_4$, NH_3, H_2O, NH_4^+, H_3O^+, PCl_5, SF_6, C_2H_4 and C_2H_2.

Periodic Properties of Elements: Mendeleev's periodic table and long form of the periodic table (Main features, merits and demerits), Periodic properties (Metallic characters, ionization potential electron affinity and electronegativity), Classification of elements into s, p, d and f - blocks, General trends of periodic properties of s- and p-block elements.

Gaseous State: Physical properties of gases, Laws governing their behavior (Boyle's Law, Charle's Law, Gay-Lussac's Law, Avogadro's law, Dalton's law of partial pressure, Graham's law of diffusion), Ideal gas equation, Kinetic molecular theory of ideal gases, Deviation from ideals behaviour, van der Waals equation of state; Continuity of states, Importance of critical constants, Liquefaction of gases.

Chemical Equilibrium: Reversible reaction, Law of mass action and its application to chemical equilibrium, Homogeneous and heterogeneous equilibrium, Le Chatelier's principle and its application, Ionic equilibria. Theory of electrolytic dissociation, Ostwald's dilution law; Arrhenius, Bronsted – Lowry and Lewis concepts of acids and bases.

Redox Reactions: Oxidation and reduction processes (classical and modern concepts), Oxidation state, Calculation of equivalent mass of oxidizing and reducing agents, Balancing of redox reactions using oxidation number and ion-electron methods.

Electrochemistry: Faraday's laws of electrolysis (statement, explanation and application), Numerical problems; Electrical conductance, specific conductance, equivalent and molar

conductances; General concept of Galvanic cell and its representation; Electrode potential, Standard hydrogen electrode and reference electrode, Electro-chemical series and its applications, EMF of a Galvanic cell, Nernst equation for electrode and cell potentials; Some commercial cells and batteries.

Organic chemistry: Classification of organic compounds, Nomenclature of hydrocarbons and compound containing one functional group, homologous series, Isomerism. General methods of preparation and properties of Alkanes, Alkenes and Alkynes. Aromatic hydrocarbons, Structure of benzene. Electrophilic substitution reactions in benzene.

Organic compounds with one functional group: Simple methods of preparation and properties of Halo-alkanes, Alcohols, Phenols, Ethers, Aldehydes, Ketones, Carboxylic acids, Derivatives of carboxylic acid, amino-, cyano-, isocyano-, azo-, and nitro- compounds.

Section-C MATHEMATICS 30 Marks.

Trigonometry: Trigonometric ratios of compound, multipleand sub-multiple angles, General solution of trigonometric equations, Properties and solution of triangles, Inverse circular functions.

Algebra: (i) Complex Numbers : Complex number and its properties, Different forms of complex numbers, roots of complex numbers, cube roots of unity and their properties, De-Moivre's theorem.

(ii) Progressions : Arithmetic and Geometric progressions, Arithmetic and Geometric means, Harmonic Progression, sum of n-terms and nth terms of A.P. & G.P.

(iii) Permutation and combinations, Binomial theorem for positive integral index, Middle term, greatest term, Binomial coefficients.

(iv) Partial fractions of different forms

(v) Determinants of order two, three and their properties.

Coordinate Geometry(2D): Coordinates of a point in a plane, distance between two points, Division of a line segment in a given ratio (internal and external division), Different forms of equation of a straight line, Distance of a point from a line, Angle between two lines, Bisector of an angle between two lines, Pair of straight lines, Equation of a circle, tangent and normal to a circle, Equation of second degree representing a conic section, Basic ideas about parabola, ellipse and hyperbola.

Coordinate Geometry (3D): Coordinates of a point in three dimensions, Distance between two points, division of join of two points. Angle between two lines, Direction cosines and direction ratios of a line, Projection of a point on a line.

Equation of a plane, Different forms of equation to a plane, Angle between two planes, Plane through three given points, Angle between a plane and line, Equation of a straight line in space, Coplanar lines, shortest distance, centre and radius of sphere.

Vector Algebra: Vector and its components, Different kinds of vectors, Addition and subtraction of vectors, scalar and vector products of two and three vectors.

Differential Calculus: Functions and their representation limit, continuity and differentiability of a function, Derivatives of elementary functions Derivatives of sum, product and quotient of functions, Derivatives of exponential, logarithmic and hyperbolic functions. Successive differentiation and Leibnitz theorem, Rolle's theorem and Lagrange's mean value theorem, L'Hospital's Rule, Curvature, Asymptotes, and concepts of curve tracing, Maxima & minima of functions of one variable.

Integral Calculus: Integration, Integral of elementary functions, Integration by parts and by substitution, Integral of rational functions and trigonometric functions, Integration of irrational functions Definite Integrals, Area under simple curves.

Statistics: Mean, median, mode and standard deviation of discrete and grouped data.

Section-D VOCATIONAL SUBJECT 70 Marks.

Note: Each Vocational Subject (from Sl. No. 1 to 8 below) consists of the Syllabus of Common Engineering Sciences (a) and that of one Trade/Branch subject (b) appropriate to the academic qualification of an applicant.

(1) AE(FE) - Agricultural Engineering (Farm Equipment Trade)

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Farm Equipment Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Tractors and power tillers : History of tractor and power tillers, technical specifications of various types and models of tractors and power tillers. Working principles of tractor and power tiller engines including fuel system, cooling system, lubrication, air intake and exhaust system. Working principles of clutch, gear box, final drive, steering, brake, hydraulic and electrical system. P.T.O. and belt pulley. Wheels and ballasting.

Farm machinery : Agricultural mechanization, scope, benefits and limitations. Land reclamation machinery **.**Equipmentrequired for seedbed preparation, sowing, planting, interculture, irrigation, plant protection, harvesting and threshing. Implement hitching, safety in operation, Machinery management.

Servicing and maintenance : Selection of site for establishing centre for repair and overhaul of tractors. Selection of hand tools, workshop machines, materials, seals and packing. Repair and preventive maintenance of general purpose machine components like fasteners, bearing, coupling, spring and elements of rotary motion drive. Fault diagnosis of various systems of engine, tractor and power tiller, checking of wear and tear, repair of worn out components and maintenance. Routine and preventive maintenance of tractor, repair and maintenance of farm equipment and land reclamation machinery.

(2) AE(FP) - Agricultural Engineering (Food Processing Trade)

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.
(b) Food Processing Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Food material characteristics and properties. Chemistry and microbiology of food, its processing and preservation. Food additives, Browning reaction. Adulteration and food laws. Nutritive value of foods.
Unit operation in food processing like washing, cleaning, sorting, grading, sizing, screening, heating, cooling, blanching, smoking and material handling etc. and related equipments. Food preservation principles and methods. Food processes such as drying, dehydration, heat treatment, refrigeration, freezing, fermentation, irradiation, evaporation and concentration etc. Food packaging materials and methods.
Processing and preservation methods of fruits and vegetables, milk, fish, meat and egg etc. and manufacture of their different products.
Instrumentation in food industry, Instruments for measurement of process parameters,
Steam generation, refrigeration and plant utilities in a food processing plant, Equipment servicing, repair and maintenance of common post harvest (including pulse and cereal milling), food and milk processing operations. Food grade engineering materials. Cleaning, hygiene, sanitation and sterilization of food processing and handling equipment.

(3) CE(CT) - Civil Engineering (Construction Technology or Draftsman / Surveyor Trade):

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Construction Technology or Draftsmanship / Surveyor Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Construction Material : Rocks, bricks, tiles, sand, cement, lime and cement mortar, concrete, timber, steel, paints and varnishes, distemper, plastics, glasses, asphalt, sound and heat insulating materials.
Construction and Maintenance: Building Construction: Types of Brick and Stone masonry; Types and components of foundations, floors, doors and windows, arches and lintels, walls, stairs and roofs; Roads: Geometric features of road WBM and BBM pavements, Equipments used in road construction; Railways: Components, Construction and maintenance of tracks, Points and Crossings; Hydraulic Structure: Types and construction of Dams and Canals.
Surveying: Various surveying instruments; Methods of chain surveying, compass surveying, plane table surveying, theodolite surveying, leveling and contouring.
Water Supply and Sanitation : Sources of water, pumps, types of distribution systems, appurtenances in distribution system, sanitary system, construction and maintenance of sewers. Different types of water supply and sanitary fittings, Septic tanks.
Civil Engineering Drawings: Signs and symbols used in Civil Engineering Drawings, Drawings related to : Different types of masonry bonds, Sub-structure details, Timber joints, Riveted, Bolted and Welded joints, and Steel and Timber trusses.
Estimation and Quantity Surveying : Types and methods of estimates; Estimation of earthwork, masonry, RCC works, flooring, plastering, white washing and painting, sanitary fittings; Specifications of construction materials and various items of works**.**

(4) ECE(ET or EM) - Electronics and Communication Engineering (Electronics Technology or Electronics Maintenance Trade):

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Electronics Technology or Electronics Maintenance Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Circuits and Devices**:** Semiconductors, type of semiconductors, doping, p-n junction diodes and their characteristics, Bipolar transistor, transistor, biasing, CE, CB and CC configurations and their characteristics, principles of class A,AB,B & C amplifier, gain, bandwidth, introduction to feedback amplifiers, Sinusoidal oscillator, clipping and clamping circuits, Mono-stable and Astablemultivibrators.
Fundamentals of Communication & Radio Engineering**:** E.M. wave propagation - ground wave, space wave and sky wave, Antenna radiation, different types of Antenna, Analog communication, AM, FM, principles of multiplexing - FDM & TDM, Introduction to digital communication, Multi - channel telephony, Super heterodyne receiver, typical circuits of various stages of transistorized receivers, working principle, RF and IF alignment, AVC and AGC.
T.V. and Audio System**:** Monochrome T.V., Interlace scanning, synchronization, blanking pulses, bandwidth requirement, VSB, Picture resolution, typical circuits of the Video amplifier and EHT stages, function of keyed AGC, AFC, various controls in a T.V. receiver, Acoustics, high fidelity and high quality sound, sound recording - Disc and Tape, pool recording systems, equalization, Microphones and speakers, P.A. system, Record player, concept of Hi-Fi stereo.
Instruments **:** Resistors, capacitors and inductors, Printed circuit board. Ammeter and Voltmeter - different types and their working principle. Analog and digital multimeters, DC power supply, Cathode ray oscilloscope and signal/function generators.

(5) EE(ET or EM) – Electrical Engineering (Electrical Technology or Electrical Maintenance Trade):

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components & tools
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Electrical Technology or Electrical Maintenance Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Basic Electricity**:** Primary, Secondary cell and charging of lead acid batteries, Capacitance and inductance their series, and parallel connection and energy storage, A.C. fundamental, wave shape, cycle, frequency, time period, peak, average and r.m.s. value, form factor, phase difference, peak factor, power factor, Series A.C. RLC circuit.
Electrical Machine**:** Magnetic effect of current, Faraday's law of electro-magnetic induction, force acting on a current carrying conductor in a magnetic field and torque production, D.C. machine-working principle of D.C. motor and D.C. generator, D.C. motor starting and speed control, common faults, causes, testing and applications, Single phase transformer - working principle. Turns ratio, voltage, current, power relation and applications, Single phase A.C. motor - commonly used single phase A.C. motors, starting, speed control, installation, testing, common faults and their causes and testing, Universal motor.
Instruments**:** Permanent magnet moving coil and moving iron, voltmeter and ammeter, Dynamometer type wattmeter, ohm meter, megger, induction type energy meter, their connection and application for measurement.
Electrical Appliances**:** Construction, principles, connection, common faults their causes and testing of the following equipments, Electric room heater, electric iron, electric stove, geyser, electric kettle, electric fans, (ceiling and table fan).
House Wiring **:** Cleat wiring, casing and capping wiring, batton wiring, conduit wiring and PVC wiring, controlling of lamps from two of three places. Schematic diagram of service connection.
Testing and connection of domestic wiring installation, Wiring faults and rectification, Installation of plate and pipe earthing, Procedure for measurement of earth resistance.
Electrical Drawing: Symbols used for common electrical equipments/appliances, Simple schematic and wiring – diagrams.

(6) ME(MC) - Mechanical Engineering (Mechanical Craftsmanship Trade):

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components & tools.
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Mechanical Craftsmanship Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Sheet metal operations, Tools and their specifications, carpentry (selection and wood working), pattern making; Various fitting tools and their specifications; Limits, fits and tolerances; Engineering and geometrical drawing; projections; isometric drawing; Reading engineering drawings;
Basic manufacturing processes like casting, forming welding and metal cutting, various casting processes, sand casting, die casting, centrifugal casting. Casting defects, melting furnaces.
Forging hammers and presses and various forging operations like upsetting, drawing, punching, etc. stock calculations.
Various welding processes and equipments, Arc welding, gas welding, electrode specification and IS codes, Arc characteristics, TIG, MIG welding, soldering and brazing.
Various machine tools like lathe, milling, shaping, drilling machines, simple calculations, Various operations like turning, facing, threading, knurling, groove cutting etc., Taper, thread cutting calculations, gear cutting on milling machine; different Grinding methods;
Materials for machine tool components and cutting tools, cutting fluid, lubricants.
Measuring Tools (i.e. vernier, micrometer, gauges, comparators etc.).

(7) ME(AT) - Mechanical Engineering (Automobile Technology Trade):

(a) Common Engineering Sciences:

(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.

Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.

Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.

Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Automobile Technology Trade:

(20 questions of 1-mark each & 15 questions of 2-marks each).

Different types of automobiles, types of IC engine and their components, auto cycle and diesel cycle, IHP, BHP and FHP and their calculations, cooling system, lubrication system, differential, transmission system, braking system, and lighting system, Two stroke/four stroke engines, valve timing diagrams, carburetor and injector repairing of trouble shooting and remedial measures, servicing of a vehicle, repairs, functions of gear box of scooter, car or truck, working of dynamo, fuel pumps, function of clutches, motor cycles or scooters, steering mechanism, wheels and tyres and their repairs.

(8) ME(RAC)- Mechanical Engineering (Refrigeration & Air Conditioning Trade):

(a) Common Engineering Sciences:
(10 questions of 1-mark each & 5 questions of 2-marks each).

Engineering Drawing : Lines, lettering and dimensioning, geometrical construction, scales, Engineering curves, conic sections, cycloid, Projection of points, straight lines, planes and solids, Sectional views, Isometric views, Auxiliary Projections.
Workshop : Hand tools for carpentry and fitting, forging, welding, specification and its use; various operations : sawing, planning, chiseling, joining, filing, marking, chipping, gas cutting, maintenance and types of maintenance (preventive and corrective), materials for machine components.
Mechanics : Vector concept, force and force system, static equilibrium, Newton's laws of motions and derived concepts like friction, centroid, area, moment of inertia, work energy principle and application of impulse.
Electricity : Concept of voltage, current, resistance, power and energy, relation between electrical, mechanical and thermal units, temperature weft of resistance. Ohm's law, series, parallel, circuits and Kirchoff's law, Capacitance and inductance.

(b) Refrigeration & Air Conditioning Trade:
(20 questions of 1-mark each & 15 questions of 2-marks each).

Refrigeration systems, Air cycle refrigeration, vapor compression cycle, deviation of actual cycle from the theoretical cycle, study of charts and tables for refrigerants. Refrigeration of refrigeration processes on temperature - entropy and pressure - enthalpy diagrams. Absorption - compressor, evaporator, pumps, valves. Components of air conditioning, humidification and dehumidification, drying, evaporative cooling, comfort charts, year round air conditioning, air conditioning of cold storage, auditorium, aircrafts, locomotives. Sensible and latent heat, heat load calculation, Psychrometry, use of psychrometric chart, air distribution and Ventilation systems, Types of fans and their ratings and mountings.

25. S Y L L A B I : NEE-III

(For 3-year Diploma holder applicants in the allied disciplines / branches, see Appendix-III, seeking admission to Degree Module in Engineering & Technology).

Full Marks : 150 Time: 3 Hours.

SECTIONS:

Section-A Physics 25 marks.
Section-B Chemistry 25 marks.
Section-C Mathematics 30 marks.
Section-D BRANCH SUBJECT70 marks.

Section-A PHYSICS 25 Marks.

Units: Fundamental & derived units with particular reference to S.I. units-illustrations. Explanation of dimensions with examples.

Mechanics: Explanation of vector and scalar quantities with examples. Displacement as vector quality. Concepts of instantaneous velocity, acceleration. Equations of motion. Definition and explanation of Laws of motion, force, mass and weight with mathematical expressions, Universal Laws of gravitation and Projectile motion. Explanation of circular motion, Satellite motion in an orbit: Kepler's Laws, escape velocity. Rigid body motion, moment of inertia, angular momentum, torque, Centre of mass, conservation of angular momentum. Simple harmonic motion and its geometric representation. Derivation of its equation. Concepts of amplitude, Oscillation, time period, frequency and phase with their mathematical expressions. Definition and explanation of work, power and energy with mathematical relation. Problems involving potential and kinetic energies and conservation of energy. Conservative and non-conservative forces. Static and Dynamic friction.

Properties of Solids: Definition and explanation of strain, stress, elastic limit, ultimate strength, Hooke's Law and Young's modulus. Compression bending, twisting and shear. Elastic moduli and their relations, Poisson's ratio. Concepts and examples of properties e.g. hardness, malleability, ductility, brittleness, toughness abrasion resistance, fatigue.

Properties of Liquids: Thrust of a liquid and pressure, Pressure at different depths, Pascal's Law and Hydraulic press, Buoyancy, Archimedes' Principle: definition and explanation with illustration; surface tension, viscosity, fluidity and volatility.

Heat & Thermodynamics: Heat and temperature, Construction of mercury thermometers. Measurement, measuring scales and devices.

Definition and explanation of linear expansion. Area and volume expansion with mathematical relation.

Expansion of gas at constant temperature and at constant pressure. Ideal gas equation.

Measurement of specific heat capacity, relation between Cp and Cv, Isothermal and adiabatic process. Explanation of change of state of matter with change of temperature. Definition of latent heat of fusion and vaporization and numerical examples.

Transfer of heat, Explanation and examples of conduction, Convection and radiation processes. Thermal conductivity. Idea of black body radiation. Stefan-Boltzmann Law.

Explanation of first and second laws of Thermodynamics with examples.

SOUND: Wave motion, Concept of longitudinal and transverse waves; Definition of period, frequency, wave length, amplitude and phase; Speed of sound wave; wave propagation in a medium; Doppler effect.

Properties of sound waves, Reflection, Refraction and Superposition of waves, stationary waves, beats, Vibration of Strings and Air columns, concept of resonance; Echo, Reverberation.

LIGHT: Explanation of light wave, wave front, ray, velocity of light.

Laws of reflection, reflection in different types of mirrors (plane, spherical, cylindrical, parabolic) with their geometrical drawing. Definition of image, focal length, radius of curvature, magnification with formula, numerical examples and application.

Laws of refraction, refractive index, total internal reflection, concave and convex lenses and image formation through them, formula connecting object and image distances, application in telescopes, microscopes, theodolite etc., refraction through prism.
Elementary ideas of electromagnetic waves. Wave nature of light. Young's double slit experiment and Fringe width. Single slit diffraction, polarisation.
Electrostatics: Explanation of charge on the basis of electron theory, charging by friction, force between electric charges, concept of unit charge, electric field and electric potential, p.d. and its measurement, definition of capacitance of parallel plate capacitor, capacitors in series and parallel. Dielectric constant.
Current Electricity: Definition of emf, potential difference, and current with illustrations. Basic direct current circuits: Units of current, resistance and conductance, Ohm's Law and solution of simple problems, effect of temperature on resistance. Series and parallel connections of resistors. Kirchoff's rules, their applications and examples.
Magnetic Properties of Materials: Type of magnetic substances, magnetic flux, flux density, relative permeability, magnetic properties of soft iron and steel.
Electromagnetism: Nature of magnetic field due to a straight conductor, a circular conductor and a solenoid, Fleming's left hand and right hand rules, Effect of current flowing through two parallel conductors, Biot - Savart Law.
Electromagnetic induction: e. m. f. induced in a coil by magnet, Faraday's law of induction, Calculation of e.m.f., Direction of induced e .m .f. Lenz's Law, Explanation of eddy current and explanation of self and Mutual induction, Calculation of self and mutual inductance.
Generation of alternating e.m.f. Concept of reactance : Capacitive and inductive, Impedance. Simple a.c. circuits analysis.
Modern Physics: Photoelectric effect, structure of atom, atoms and molecules, intermolecular forces, chemical bonding. Crystal structure with simple examples.
Radio-activity: Explanation of fission and fusion processes.
Semiconductors: Properties and basic principles, p and n types, Action of transistors.

Section-B CHEMISTRY 25 Marks.

Physical Chemistry:
States of Matter: Gaseous State: Postulates of kinetic theory of ideal gases; Derivation of kinetic equation; Derivation of Ideal gas equation. Continuity of states, Liquefaction of gases. Solid State: Structure of solids, unit cell, fcc, bcc, ccp structure of solids.
Solution and Colloidal solution: Concentration of solutions: Mass percent, Mass fraction, Mole fraction, Molality, Normality, Molarity. Dilute solutions: Raoult's law, its statement and explanation; Ideal and non-ideal solutions; Colligative properties: Relative lowering of vapour pressure, Elevation in boiling point, Depression in freezing point, Osmotic pressure and its determination. Determination of molecular masses based on colligative properties; Van't Hoff theory of dilute solutions, Van't Hoff factor.
Colloidal solutions: Definition, Classification, and Preparation of colloidal solutions; Properties of colloidal state: Tyndall effect, Electrophoresis, Brownian movement; Protective colloids.
Thermodynamics and Thermochemistry: First law of thermodynamics, mathematical formulation of the law, Isothermal and adiabatic changes; Relation between heat capacities at constant pressure and constant volume; Second law of thermodynamics: Carnot cycle and derivation of an expression for efficiency of a reversible engine. Concept and physical significance of Entropy, Gibbs energy and work-function relation; Gibbs energy change and chemical spontaneity. Thermochemistry: Heats of reaction, Hess's Law of constant heat summation.
Kinetics and Chemical Equilibrium: Rate of reaction, law of mass action, velocity constant. Reversible reactions and chemical equilibrium, Equilibrium constant. Le Chatelier's principle (statement, explanation and it's industrial applications). Molecularity and Order of reaction, First and Second order of reactions, Rate law equation and mechanism of reactions. **Ionic Equilibria**: Modern Ionic theory; Modern concepts on acids and bases; Strength of acids and bases, Ionic product

for water, pH scale. Common-ion effect and Solubility product, Their applications in qualitative inorganic analysis and indicators.

Inorganic Chemistry:

Atomic Structure and Chemical Bonding: Electrons, protons and neutrons, their charges and relative masses. The early models of the atom. Rutherford's model, Hydrogen spectra; Failure of Rutherford's model. Bohr's model of hydrogen and hydrogen like atoms; Dual nature of electron, de-Broglie equation, Uncertainty principle. Quantum numbers (i.e., quantum numbers and their application to electronic structure of atoms), Concept of atomic orbital, Pauli's exclusion principle, and Hund's rule, Aufbau principle.

Ionic Bonds: Definition, factors influencing the formation of ionic compounds, Lattice energy of ionic compounds. Covalent Bonds: Nature of covalent bond (Lewis concept), Concept of orbital overlap in bond formation, Sigma and pi bonds, Hybridization of atomic orbital (sp, $sp,^2$ sp^3 hybridization), Properties of covalent compounds, Structure of simple molecules such as H_2O, NH_3,CH_4, C_2H_4, C_2H_2, PCI_5 and SF_6. Co-ordinate covalent bonds: Lewis concept, structure of H_3O^+ and NH_4^+ ions on the basis of hybridization, Properties of co-ordinate covalent compounds.

Metallic bonds: Bonding in metals (elementary treatment only), Insulators, Conductors and Semi-conductor, Extrinsic semi-conductors (n-type and p-type). Hydrogen bond: Types of hydrogen bond, Consequences of hydrogen bonding.

Periodic Properties of Elements: Mendeleef's periodic table and periodic law; Long form of periodic table, its merits and demerits. General characteristics, Properties of s-block, p-block and d-block elements. Trend of periodic properties of elements such as atomic volume, atomic radii, ionization potential, electron affinity and electronegativity in periodic table (qualitative treatment only).

Metallurgy: General principles of extraction of metals, Occurrence of metals, sources of different metals. General method of extraction of metals by pyrometallurgical process and by electrolysis (different principles only).

Ferrous metallurgy: Ores of iron, Metallurgy of iron and manufacture of steel. Properties of Cast iron, Wrought iron, Steel; Effects of carbon, silicon, phosphorous, sulphur, manganese on cast iron and steel.

Non-ferrous metallurgy: Ores of aluminium and copper, Metallurgy of aluminium and copper; Properties and uses of Lead, Zinc, Tin and Chromium.

Alloys: Effects of carbon and other alloying elements on the properties of steel. Composition and uses of the following alloys: Brass, Bronze, German silver, Bell metal, Gun metal, Duralumin, Nanganin, Type metal, Nichrome and Solder.

The chemistry of some chemicals: Ammonia, Nitric acid, Sulphuric acid, Hydrochloric acid, Hydrogen and Oxygen.

Organic Chemistry:

Introduction: Classification and nomenclature of organic compounds. Qualitative detection of Nitrogen, Sulphur and Halogens. **Hydrocarbons**: Saturated and unsaturated aliphatic hydrocarbons. Preparation and properties with special reference to methane, ethane, ethylene, acetylene. Aromatic hydrocarbons: Preparation and properties of benzene; Structure of benzene. **Haloalkanes and Haloarenes**: Preparation, properties and uses of haloalkanes and polyhalogenderivatatives such as $CHCl_3$, CHI_3, DDT.

Compounds with functional groups containing oxygen: General methods of preparation and properties of Alcohols and phenols, Aldehydes and ketones, Carboxylic acid and acid derivatives**.**

Compounds with functional groups containing nitrogen: Preparation and properties of Nitrocompounds, Amines and Azo-compounds.

Industrial Chemistry: Plastics & Polymers: Definition of a polymer; Polymerization (Addition and condensation); Thermoplastic and thermosetting resins; Some commercially important plastics. Rubbers and their vulcanization.

Fuels: Definition of fuel, classification of fuels with examples; Calorific value (gross and net). Solid Fuels: Different types of solid fuels, ignition point, Carbonization of coal, Destructive distillation of wood (name of different products only).Liquid fuels: Fractional distillation of crude oil (only names of different fractions, boiling ranges and uses of different fractions); Properties of liquid fuels: Flash point, power point, viscosity, specific gravity carbon residue; Octane and cetane number.

Gaseous fuels: Different commercial gaseous fuels with their composition and calorific value; Manufacture of Producer gas and Water gas (principles with physico-chemical reactions only).
Water: Hard and soft water, Boiler feed water, Scale formation, Priming and foaming, Caustic embrittlement, Water softening methods, Treatment of water for town supply and sewage disposal.
Corrosion and its protection: Definition, Theories of corrosion, Factors affecting rate of corrosion, Rusting of iron, Demerits of corrosion, Prevention of corrosion by various methods**.**
Environmental Pollution: Air and water pollution: causes and remedy.

Section-C MATHEMATICS 30 Marks.

Algebra: Arithmetic, Geometric and Harmonic Progressions, Permutation and Combination, Binomial expansion for positive index, middle term, greatest term, binomial expansion for general index. Determinants up to third order, their properties and application to solve linear algebraic equations (Cramer's rule), concept of a matrix, types of matrices, equality of matrices, operations of addition, scalar multiplication and multiplication of matrices, determinant of a square matrix, transpose, adjoint and inverse of a matrix, consistency and inconsistency of a system of linear equations, solving a system of linear equations in two or three variables using inverse of a matrix.
Trigonometry: Inverse trigonometric functions, solution of inverse trigonometric equations.
Coordinate Geometry(2D): Points and their coordinates in a plane, distance formula, area of a triangle, condition for the collinearity of three points and section formula, various forms of equations of a line, intersection of lines, angles between two lines, condition of concurrency of three lines distance of a point from a line, pair of lines, circle, tangents and normal to a circle, simple problems on parabola, ellipse and hyperbola.
Differential Calculus: Partial derivatives, maxima & minima of single & two variables, tangent and normal, curvature and derivative of arc.
Integral Calculus: Integration of rational and irrational functions, integration of transcendental functions, definite integration, area bounded by curves, length of arc and volume of surface revolution.
Differential equation: Linear differential equations of first and second order & their applications.
Vector Calculus: Gradient, divergence & curl, line integral, surface integral & volume integral.
Coordinate Geometry (3D): Points and coordinates on 3-dimensional space, Distance between points, direction cosines, direction ratios, projections, equation to a plane, angle between planes, distance of a point from a plane, angle between lines & planes, condition of co planarity of two lines, shortest distance between two lines, condition for the intersection of two lines.
Probability: Problems on probabilities, conditional probability, Bye's Theorem, Binomial & Poisson distributions.

Section- D BRANCH SUBJECT (70 marks).

Note: Applicants should choose only one Branch subject from Sl. No. 1 to 6 appropriate to their academic qualification in 3-year Diploma.

1. AGRICULTURAL ENGINEERING (70 marks).

General Engineering Science: Laws of thermodynamics: Zeroth law, first law, second law. Concept of enthalpy, internal energy, entropy and absolute temperature. Properties of pure substances and mixtures, reversibility and irreversibility. Thermodynamic cycles, Carnot cycle and steam power cycles, otto, disel and dual cycles.

Equivalent forces at a point, simplest resultants in two and three dimensions, equations of equilibrium, free body diagrams and reactions. Two dimensional frames and trusses. Principle of virtual work, frication forces. Belt, rope and chain drive and power screws. Centroids, mass centers, second moment and product of inertia of plant area. Velocity, acceleration, rectilinear, curvilinear co-ordinate system and relative motion, particle dynamics, equation of motion.

Concept of stress and strain, normal and shearing stresses and stains. Stress-strain diagrams for uniaxial loading. Deformation of axially loaded members, torsion of circular shafts. Stress and deflections in closed coiled helical strings subjects to flexural loads. Reactions for statically determine beams, relationships between load, shearing force and bending moment, shear force and bending moment diagrams. Theory of simple bending stresses, shearing stresses in beams, principal stresses and principal planes, principle strains, principal stresses in 3D, relation between elastic constants, combined torsion and bending, pressure vessels, biaxial, stresses, yield theories, deflection of beams.

Properties of fluids: Pressure and its measurement. Hydrostatic forces on surface. Kinematics and dynamics of fluid flow. Dimensional analysis and similitude. Laminar and turbulent flow in pipes, general equation for head loss, energy loss trough pipe fittings.

Measurement of distance and areas: Principle and methods of chain surveying, prismatic compass and chain traversing. Theodolite traversing. Plane table surveying including two point and three point problems. Leveling and contouring, measurement of areas and volumes.

Engineering properties of granular materials, soil classifications, fundamental definitions and relationships. Determination of index properties of soil. Permeability and seepage analysis. Stress distribution. Shear strength. Mohr's circle of stresses. Compaction. Active and passive earth pressures. Stability analysis of earthen slopes.

Farm Power and Machinery: Salient features of various source of farm power used in India, Farm engine, tractors and power tillers, their selection, operation and adjustment. Principles of working and construction of I.C. engine. Engine valves and operating mechanism, fuel and combustion. Different systems of I.C. engine such as fuel, lubrication, cooling, intake, exhaust etc. Study of clutch, brake, gearbox, differential, final drive hydraulic and electrical system of farm tractors. Use of electrical motors as a source of farm power.

Scope, need and constraints of mechanization. Types of implements, field capacities, constructional details, design criteria and principals of operations of different types of hand tools. Animal, power tiller and tractor operated primary and secondary tillage implements such as indigenous plough, mould board plough, disk plough, rototillers, harrow, cultivator, subsoilar, leveler etc. Types principles and constructional details of weeder, seed and fertilizer drill, planters, transplanters, sprayer, duster, mower, vertical conveyor reaper, threshers and combine harvesters.

Soil and Water Conservation Engineering: Water resources utilization in India. Ground water resources development and utilization, Hydraulics of wells, open well and tube well design and construction. Water lifts and irrigation pumps. Measurement of irrigation water. Water conveyance and its control. Irrigation efficiencies, irrigation scheduling. Design of irrigation channel and seepage analysis. Design of underground pipelines. Soil-plant-water relationships. Land grading and field layout for efficient irrigation. Introductory concept of farm irrigation methods: border, check basin, furrow, sprinkler and drip. Drainage: importance, problems, types and requirements in agriculture, drainage coefficient, dynamics of soil-water, measurement of soil permeability, field drainage layout patterns.

Hydrology: Hydrologic cycle, precipitation, infiltration, evaporation, runoff and its estimation and measurement. Types and mechanics of wind and water erosions, biological and engineering measures of controlling erosion, gully control and gully control structures. Vegetative waterways and their design, stream bank erosion and its control, design, construction and maintenance of farm ponds. Introduction to watershed management.

Post Harvest/Process, Food Engineering and Farm Structures: Engineering properties of biological materials: Rheology of agricultural products. Mixing and mixers. Psychrometry; theory of grain drying, different types of grain dryers and dryer efficiency. Size-reduction and energy requirement, Kick's law and Rittinger's law, roller mill, burr mill and hammer mill. Storage of grains, lateral and vertical pressure relationship.

Importance of agricultural processing: process of cleaning, grading and sorting, and related equipments. Material handling equipments. Processing of cereals, pulses, oil seeds. Layout, maintenance and testing of related machinery and plant. By-products utilization; combustion, gasification and other chemical and bio chemical transformations.

Properties and classification of building material like bricks, lime, cement, sand, coarse aggregates, timber, asbestos, glass etc. Animal shelters and storage structures in fans.

2. CIVIL ENGINEERING (70 marks).

Strength of Materials & Theory of Structures:
Normal stress, shearing stress, Normal strain, Hooke's Law, Stress-strain behaviour of mild steel, Poisson's Ratio, Shearing strain, Torsion of Circular Shaft, Relations among load, Shear and Bending Moment, Shear and Bending-Moment Diagrams, Pure Bending, Bending of Members Made of several Materials, Shearing Stresses in a Beam, Mohr's Circle for Plane Stress, Principal Stresses, Maximum Shearing Stress, Euler's Formula for Pin-Ended Columns and columns with other End conditions.
Equation of the Elastic Curve by Double Integration Method, Slope and Deflection of Determinate Beams by Moment-Area Theorems, Deflections and Slope by Energy Methods, Castigliano's Theorem, Stability and Degree of Indeterminacy, Rolling loads and Influence lines for Determinate Beams, Trusses, and Floor Girders, Cables and Three-Hinged Arch.
Water Resources Engineering: Hydrology: rainfall, stream flow measurements, runoff, hydrographs, flood studies, reservoir and channel routing, flood forecasting, flood protection measures, river training works, well hydraulics; Irrigation: Command area, duty and delta, canal outlets,
crop-water requirement.
Fluid Mechanics: Properties of Fluid, Manometry, Forces on Plane and Curved surfaces, Flow classification, Continuity Equation, Momentum Equation, and Energy Equation and their Applications, Orifices, Venturimeter, Weirs and Notches, Laminar and Turbulent Flow through Pipes, Darcy Weisbach Equation, Moody Diagram, Steady Uniform Flow in Open Channels, Manning's Formula.
Geotechnical Engineering: Preliminary definitions & relationship, Determination of index properties, classification of soils, soil structure and clay mineralogy, permeability, Darcy's law, seepage analysis, compaction, one dimensional consolidation, Terzaghi's theory, shear strength, theoretical consideration and tests, shallow and deep foundations, soil exploration.
Highway and Railway Engineering: Highway Geometric Design: Cross sectional elements, Sight distances, horizontal and vertical alignments; Types and components of Pavement structures, Design of Flexible Pavements; Traffic Characteristics: Road user and vehicular characteristics, traffic volume studies, O-D studies and traffic capacity studies;
Railways: Components, construction and maintenance of rail tracks, points and crossings.
Surveying: Contouring, Theodolite and its adjustment, measurement of angles and setting out lines, Trigonometrical leveling, Tacheometry, Curves and different methods of setting out curves, Introduction to electronic Theodolites and Total Stations.
Structural Design: Working stress methods of design, singly and doubly reinforced sections, rectangular and Tee beams, shear, torsion and development length, one and two way slabs, short and long column, Design of isolated footings, Introduction of limit state design, Design for flexure, shear and compression, Design of riveted and welded connections, tension and compression members, splicing and lacing, Beam column connection, roof trusses.
Environmental Engineering: Estimation of quantity of water, per capita demand, population forecasting, water quality parameters, treatment of water, distribution system, Estimation of quantity of sewage, dry weather flow and storm run off, sewer appurtenances, characteristics of sewage, treatment and disposal of sewage, sludge digestion.

3. COMPUTER SCIENCE AND ENGINEERING (70 marks).

Operating System & System Software:
Overview of Operating Systems, Operating Systems Structures, Uses, Types and Functions of Operating Systems. File Systems, File System Implementation. Concept of Process-Process Management, Process Synchronization and Deadlocks, Inter-process Communications, CPU Scheduling. Memory Management – Allocation Schemes, Paging Segmentation, Virtual Memory, Demand Paging, Paging Replacement Algorithms. Disk Management – Disk Scheduling Algorithms. System Softwares- Functions and Uses of System Software, Assemblers, Loaders, Linkers, Pass Structure of an Assembler, Loading Schemes, Macro and Co-Routines, Macro Processing and Macro Calls, Sub-Routines and Sub-Routine Calls.

Digital Electronics & Elements of Logic Design: Various Number Systems and their Implementation, Binary Arithmetic, 1's Complement, 2's Complement, 9's Complements & 10's Complements of a number. Floating Point Numbers, Boolean Algebra and Logic Functions. Different Methods of Minimizing Boolean Functions. Design of Combinatorial Circuits – Adders, Multiplexer, Demultiplexer, Decoder, Parity Generator and Checker, Comparator Etc. Switching Algebra, Function Decomposition, Symmetric Function, Contact Networks, Design of Sequential Circuits (Synchronous & Asynchronous) Flip-Flops, Register, Counter Fault Tolerant, Hazard, Stuck-At-Fault, Bridging Fault, Stuck-Open-Fault.

Microprocessor, Computer Architecture &Organization :8085 Microprocessor Architecture, Instruction Set, Assembly Language Program, Counters and Delays, Interrupts, Interfacing Data Converters, Programmable Interface Devices : 8155 Multipurpose Programmable Device, 8279 Keyboard/Display Interface, 8254 Interval Timer, 8259 Interrupt Controller, 8237 DMA Controller.
CPU Structure and Function, Basic Idea of Hardware And Software, Instruction Sets : Characteristics, Functions and Formats, Addressing Modes; Computer Arithmetic, Control Unit : Microprogram Control, Hardwired Control; Memory : Internal Memory Organization, External Memory (Magnetic Disk, RAID, Optical Memory, Magnetic Disk), Cache Memory and Mapping Procedures; I/O Organization : Interrupts, Programmed I/O, Interrupt-Driven I/O, DMA, I/O Channels, Standard I/O Interfaces; RISC and CISC Processor, Basics of Parallel Processing, Pipelining.

Programming Language Concepts : Programming in C And C++, Syntax, Preprocessor Directives, Built-In Data Types, User-Defined Data Types, Operators and Precedence, Loops and Conditional Flow of Control, Enumerated Types, Arrays, Variable Types and Scope of Variables, Global, File and Namespace, Functions, Pass By Value, Pass By Reference, Input and Output Handling, File Handling. Operator and Function Overloading, Single Inheritance, Polymorphism, Virtual Member Functions, Constructor and Destructor, Information Hiding, Encapsulation, Data Members, Member Functions, Public and Private Access.

Data Structures: Arrays, Link Lists, Stacks, Queues, Trees, Graphs : Representations, Implementations and their Applications – Arithmetic Expression Evaluation, Recursion, Priority Queues, Etc., Graph and Tree Traversals, Basic Search Techniques : Tree Searching: Binary Search Trees, Avl Trees, Etc., Hashing Techniques.
Basic Sorting Techniques : Bubble Sort, Insert Sort, Selection Sort, Radix Sort, Tree Indexes : M-Way Search Trees, B-Trees, B+Trees.

4. ELECTRONICS & COMMUNICATION ENGINEERING (70 marks).

Electronic Devices and Circuits:
Analog Devices and circuits: Physics of Semiconductor Materials & Components, Energy band diagram, Fermilevel, Hall effects.
Devices: Diodes, BJT,s FET,s, Thristors, Tunnel diodes, Basics of IC,s and operational amplifiers.
Circuits: Biasing circuits of transistors, Design of power supplies using Diodes and transistors-voltage Regulator Circuits Transistor Amplifier (BJT & FET), Power amplifiers, feedback amplifiers, oscillators (qualitative analysis only). Multivibrators, Time base circuits. Regulated Power supply. Time base circuit Saw-tooth voltage and current generators, transistor switches, wave shaping circuit (diode and transistors) Electro-static and magnetic deflection methods, low frequency h-parameter transistor & FET models, Pi models.
Digital Devices and Circuits: **Number systems:** logic gates-Boolean Algebra-Transistor as a switch-logic families-Arithmetic and logic circuits-Counters and shift registers-A/D and D/A converters, Multiplexer, Demultiplexer, Encoder, Decoder.
Microprocessors: Architecture-Assembly language programming of 8085-peripheral devices-Interfacing of memory and devices.
Semi Conductor Memories: RAM, ROM, Storage devices, printer, Connectors, floppy drives, Organization of computer, simple programme.
Electronic Instrumentation and Measurements:
Systems, units and standards of Measurement, AC and DC indicating instruments, AC and DC bridge circuits, Error Analysis of generalized measurement systems, transducers (Strain gauge, LVDT. Thermistor, Thermocouple etc.) Electronic Measuring Instruments, CRO, Digital Ammeter, Millimeter, Voltmeter, Time and Frequency measurements, Signal Generators, Q-meter, Wattmeter, Energy meter.
Networks-Filters And Microwave Engineering:
Network theorems, Single and Two port networks, T-type, II-type ladder type networks. Transmission lines: Characteristics impedances, Attenuators, Equalizers, Basics of wave guides-Transmission line charts.
Filters: type, simple design problems, Basics of Electromagnetic theory , Maxwell's equations. Basics principles of wave propagation. Fundamentals of Antennas and Radar, Basics of Microwaves, EM Spectrum Principles of microwaves devices and circuits.
Communication Engineering: Introduction to signal analysis-Fourier series and Fourier transform. Sampling theorem, Parseval's theorem, convolution, Transmission through linear systems: AM,FM PM, Pulse modulation; PCM: Amplitude limiting in FM, Pre-emphasis, De-emphasis; Noise in AM and FM: Multiplexing-FDM, TDM; ASK, FSK, Block schematic of different transmitters for AM, FM,SSB, ISB systems; Superheterodyne receivers, Mixers, AGC, AFC, spectrum of EM waves; Propagation of EM waves-sky waves- sky wave, ground wave, space wave, skip distance, maximum usable frequency; Antenna fundamentals and Radiation; Communication systems;: Principles of telegraphy, telephony and television broadcasting , Basics of satellite and optical fibre communications: Fundamentals of telematics.

5.ELECTRICAL ENGINEERING (70 marks).

Electrical Circuits: Phasors and phasor algebra, balanced and unbalanced poly-phase circuit, Test signals, Star-Delta transformation, Network theorems, Parameters of electromagnetic circuits, resonance in R-L-C Series and Parallel circuits, Network analysis by mesh and node methods.

Electrical Engineering Materials:

Conducting, Insulating materials and Magnetic materials, Properties and applications

Electrical Instruments and Measurements:

Principles of measurements: Classification, accuracy and sensitivity, damping and control forces, shunt and multiplier, Measurement of resistance: Low, medium and high. Principle and uses of DC potentiometers, AC Bridges. Indicating instruments: Multimeter, PF meters, synchroscope.

Electrical Machines: Classification of D.C. machines: Constructional features, e.m.f., torque, excitations, motor performance, speed, power, size considerations, speed control, efficiency.

Transformers: Induced e.m.f., equivalent circuits, regulation, different efficiencies.

Three phase induction machines: Torque characteristics, Starting, equivalent Circuits.

Three Phase Synchronous Machines: Generation, voltage regulation, parallel operation, synchronous motor, starting and V-curves, Single phase motors: type, starting characteristics.

Generation, Transmission and Distribution:

Generation: Thermal, Hydel and Nuclear Power Stations, Prime movers and alternators.

Transmission: Voltage levels, line conductors, electrical line parameters of short and medium lines, voltage regulation, corona. **Distribution:** D.C. and A.C. systems, voltage level, types of distribution feeders and distributors, voltage drop and effects, power factor improvement plant.

Substation: Different types, site selection, equipments, electrical earthing. **Switchgear:** Switches, isolators, circuit breakers and their types. Protection: Fault current and protective devices, fuses, relay functions, alternator, Transformer protection, thermal relays, over voltage-causes, effect and protective devices.

Electrical Estimation and Costing: Estimation of materials for industrial and residential installations. UPS and small diesel generating-set and accessories. Cost estimation of materials and selection criteria, Design and calculation of the cost of 400V/230V three phase 4 wire, 100-500 KW overhead line, Tenders.

Electrical Power Utilization: Design of lighting system. Electrical Heating: Resistance heating, Induction heating, Arc heating and Dielectric heating, types of electric welding Electrochemical process: Principles, equipment and procedure. Electrical Drives: Characteristics of various electric drives, speed control, starting and breaking, mechanical consideration, selection of motors.

Power Electronics: Power diodes and Darlington Pair. Thyristor: Principle, thyristor family, firing circuits, applications, Selenium rectifiers, uncontrolled and controlled rectification, Power MOSFETS.

Digital Electronics: Digital signals, gates, Boolean algebra, logic families, multiplexures /demultiplexure, Encoders/decoders, flip-flops, registers, counters and applications of logic gates, OPAMPS in timing circuits, A/D and D/A conversion.

Computer Programming: Concept of low level and high level languages, Block-diagram, concept of flow chart, and algorithm, Assemblers, Macros, sub-routines, co-routines, loaders, linkers, editors and compilers, programming and file handling in C and C++.

6. MECHANICAL ENGINEERING (70 marks)

Engineering Mechanics & Strength Of Materials: Vector concepts, rest and motion, Introduction to force systems (Parallel, Concurrent & Coplanar); Free Body Diagram; Equilibrium principle; Static analysis of systems; Friction and impending motion; rolling and sliding of cylinders; Newton's law of motion and derived concepts. Centroid; Area & mass moment of inertia. Work-Energy principle; Impulse; Collision of two bodies; Plane motion of particles and applications; Static analysis of simple structures; Method of joints and method of sections. Virtual work; combined motion of rotation and translation; Transmission of power by belt and gear drives.

Stress & strain; Shear stresses, Principal stress and strain, Mohr's circle for stress and strain analysis, Beams & columns; Shear force and bending moment diagram. Theories of Failures; Columns, Struts; Stress & strain analysis of shafts under torsion, analysis of springs.

Engineering Materials: Mechanical, thermal, chemical properties, structure of materials, alloys. Iron and its alloys, Iron carbon phase diagrams, steel and their important alloys of iron, heat treatment processes, Elastic & plastic behaviors; Plastic deformation. Effect of various alloying elements on mechanical properties of Iron: Bearing alloys; Powder metallurgy; Fick's law. Commonly used engineering materials for tools, engineering components and household objects.

Design of Machine Element: Concept of FOS, material selection, engineering materials, Design of Rivets, Screws, Bolts with detail analysis. Cotter and Knuckle joints, shafts, keys and couplings, Springs – helical and leaf types.

Hydraulics and Hydraulic Machines: Properties of liquid, hydraulic pressure and its measurement, Forces on immersed bodies; Center of pressure; Buoyancy stability of immersed and floating bodies;

Flow of liquids: 1-D, 2-D, & 3-D flows; steady, unsteady, laminar and turbulent flows; continuity equation, momentum equation, and energy equation and their applications, Euler equation and Bernoulli's equation; Orifice, mouth piece and nozzles, flow through pipes and piping systems, losses in piping systems; fundamentals of channel flow, hydraulic jump; flow measurements :

Dimensional analysis and associated theorems. Non dimensional numbers and their significances;

Stream function and velocity potential function; streamline, streakline and pathline; Rotational and irrigational flow, circulation and vorticity; Free and forced vortex; Basic flows like rectilinear, source, sink, doublet etc.

Different types of pump, reciprocating and rotary pumps, operation and maintenances of pumps, Cavitations and NPSH; Characteristic curves of pumps, losses and efficiencies of pumps. Compressors, blowers and fans. Different types of turbines, Francis, Kaplan and Pelton turbines, operation and maintenance of turbines; characteristic curves, work done and efficiency of turbine, specific speed and selection of pumps and turbines. Hydraulic machinery like hydraulic ram, hydraulic coupling and torque converter, hydraulic jack, screw pump, Gear pump, Vane pump etc.

Thermal Engineering: Basic thermodynamic concepts; System and surrounding; Thermodynamic Properties; Intensive and Extensive properties; Point and path functions; Zeroth law, first and second laws of thermodynamics and associated corollaries; Concepts of absolute temperature, internal energy, enthalpy & entropy; Clausius inequality, concept of availability, Maxwell's relations. Application of thermodynamic laws, reversibility & irreversibility, internal & external irreversibility; Pure substances and mixtures. Thermodynamic cycles: Carnot cycle, Rankin cycle, Joule-Brayton cycle; Air standard cycles; Otto cycle and Diesel cycles.

Ideal gas compression and compressors, jet propulsion, gas compressors, stream generators, Fuel and combustion, I.C. engine, calculation of efficiencies, testing of IC. Engines; Open and closed gas turbine cycles, introduction to heat and mass transfer; heat exchanger; LMTD and NTU methods. Principles of refrigeration, air refrigeration system, Vapor compression refrigeration system, refrigeration cycles, use of T-S & P-H charts for refrigeration, refrigerants and their properties, vapor absorption system, psychometric properties and charts.

Types of power plants; components of steam power plant; hydro-electric power plant, nuclear power plants, diesel power plant. Elementary solar and geothermal power systems.

Theory of Machines: Kinematics and kinetics; mechanisms and structure; inversions; kinematic chains; different types of mechanisms; degree of freedom & its determination; Grashof's criteria;

velocity analysis; acceleration analysis; gear trains; balancing of rotating masses; brakes & dynamometer.

Production and Industrial Engineering: Fundamentals of metal cutting, tool geometry, Calculations of cutting forces and tool life; General purpose machine tool and their operations, various welding techniques like arc, gas, resistance etc. Metal forming methods like rolling, drawing, extrusion, press working; powder metallurgy; heat treatment of metals; Introduction to NC and CNC machines; basics of measuring instruments; study of transducers; static and dynamic characteristic of instruments; Introduction to metrology: Limits, fits and tolerance, Mechanical and optical comparators; Measuring instruments of angles; measurements of surface roughness and thread profiles, calibration of various measuring instruments.

Production planning; Inventory control; material and wage calculation; elements of cost; network analysis; work study and estimating machining time; break even analysis; TQM & ISO 9000; Shop floor management; Machines & Industrial safety.

APPENDIX - I

Branch in which admission is admissible	Allied Branches
Agricultural Engineering	Agricultural Engineering
Civil Engineering	Civil Engineering; Civil Engineering (Draftsmanship); Civil Engineering (Construction Technology); Construction Technology; Building Construction; Public Health Engineering; Civil Engineering (Public Health Engineering); Water Resource Engineering; Civil Engineering (Management of Water Resources); Transportation Engineering; Rural Technology; Civil & Rural Engineering; Rural Engineering; Civil & Rural Technology
Computer Science & Engineering	Computer Technology; Computer Science; Computer Engineering ; Computer Sc. & Engineering; Computer Sc. & Technology; Computer Hardware Maintenance; Computer Science & Hardware Engineering; Special Diploma in Electronics (Computer); Information Technology
Electronics & Communication Engineering	Applied Electronics; Industrial Electronics; Special Diploma in Electronics (Industrial Electronics); Electronics Engineering; Electronics (Consumer); Electronic Equipment & Trouble Shooting; Consumer Electronics; Electronics &Micro processors; Micro-processors; Microprocessors & Micro-based System; Electronics Communication System; Electronics Fiber Optics; Electronics Communication; Electronics & Electrical Communication; Special Diploma in Electronics (Communication) Telecommunication; Electronics & Communication Engineering; Telecommunication (Electronics & Telecommunication); Telecommunication Engg.; Telecommunication (Sound & Television); Electronics & Radio Engineering; Electronics & Radio Technology; Electronics, Television & Sound Engineering; Sound & Television Engg; Television & Video Engineering System; Audio & Video Engg,, Electronics & Instrumentation, Electrical and Electronics Engineering, Instrumentation Engineering, Electronics & Telecommunication Engineering, Control & Instrumentation
Electrical Engineering	Electrical Engineering; Electrical Engineering & Electronics Control; Electrical Engineering with Industrial Control; Electrical Power System, Electrical & Electronics Engineering, Electrical Power or Power Control, Electrical & Electronics Control Engg., Electrical Power Engg., Electrical Instrumentation, Control & Instrumentation, Power Electronics
Mechanical Engineering	Mechanical Engineering (Maintenance); Mechanical Engineering (SW); Fabrication Technology; Fabrication Engineering; Mechanical Engineering (Sheet Metal & Welding); Mechanical Engineering (Maintenance Engineering); Machine Tool Maintenance & Repair; Mechanical Engineering (Instrumentation), (Mechanical Engineering), (Tube Well Engineering); Thermal Engineering; Mechanical Engineering (Heat Power Engineering); Robotics; Mechanical Engineering (Design, Drawing & General); Mechanical Engineering (Machine Design & Drafting); Mechanical & Rural Engineering, Automobile Engg., Manufacturing Engg., Welding Technology, Foundry/Forging Technology, Maintenance & Plant Engg., Industrial & Production Engg.

You cannot choose from blue colored options