

हिमाचल प्रदेश तकनीकी विश्वविद्यालय  
हमीरपुर-177001, हिमाचल प्रदेश (भारत)

हिमाचल प्रदेश अधिनियम-16, 2010 के अधीन स्थापित,

**HIMACHAL PRADESH TECHNICAL  
UNIVERSITY**

**HAMIRPUR – 177001, HIMACHAL PRADESH (INDIA)**

[A STATE GOVERNMENT UNIVERSITY ESTABLISHED UNDER STATE LEGISLATIVE ACT-16 OF 2010]

सूचना पत्रिका

**INFORMATION BROCHURE**

**Himachal Pradesh Common Entrance Test**

**(HPCET – 2022)**

**(FOR ADMISSION TO VARIOUS TECHNICAL & PROFESSIONAL COURSES)**

## IMPORTANT DATES

### HPCET-2022

Course	Starting date of filling in online application	Closing date of filling in online Application Form	Date and time of Entrance Examination
B. Tech (Direct Entry)	21-04-2022	18-06-2022	10.07.2022 (09.00AM to 12:00 Noon) Morning Session
B. Pharmacy (Direct Entry)	21-04-2022	18-06-2022	10.07.2022 (09.00AM to 12:00 Noon) Morning Session
MCA	21-04-2022	18-06-2022	10.07.2022 (09.00AM to 11:00 A.M) Morning Session
MBA & MBA (T& HM)	21-04-2022	18-06-2022	10.07.2022 (2.00PM to 4:00 PM) Evening Session

Website: [www.himtu.ac.in](http://www.himtu.ac.in)

Correspondence Address:

Controller of Examinations, Himachal Pradesh

Technical University, VPO Daruhi, Distt. Hamirpur (H.P.), Pin- 177001

Email Id:coehimtu@gmail.com

# THE UNIVERSITY

## PREAMBLE

The Himachal Pradesh Technical University was established in the year 2010 by an Act of Legislative Assembly of Himachal Pradesh with an objective for value creation and welfare of society through technical education training, research, innovation, entrepreneurship and continuing education programs. At the same time, the University is responsive to the changing and exceptional requirements of our society and economy and contributes to find answers to global problems. The University offers both short-term and long-term programs leading to Advance Diploma and Degrees, which are conventional as well as innovative through public and private participation. Most of these programs have been developed after an initial survey of the demand for such Programs. The programs offered are designed to equip graduates with the necessary skills and expertise to be the leaders in their chosen professions. The key to success lies in the high premium it places on innovation, along with the work that is done by different role players and stakeholders to promote the University achievements in the fields of Science, Engineering and Technology. This is being achieved through a benchmarking system, which ensures that training and research programs always meet the highest standards.

## Vision

Our vision is of autonomous Himachal Pradesh Technical University as dynamic, flexible institution promoting research led inter disciplinary learner-centric technical education which generates added value in teaching-learning, research and knowledge required for promoting integrated national development with global understanding.

## Core Values

A primary core value of any university is academic freedom, which is enshrined in the Constitution of the Republic of India. This core value must be buttressed by institutional autonomy, but within an environment where public accountability is seen as a virtue. Principles and behaviors defined in the Charter must accord with these and the institutional core values below:

- Customer service
- Integrity
- Diversity
- Innovation



**THE UNIVERSITY OFFICERS**

**CHANCELLOR**

**SHRI RAJENDER VISHWANATH ARLEKAR  
HIS EXCELLENCY  
THE GOVERNOR OF HIMACHAL PRADESH**

**VICE-CHANCELLOR**

**SH. AMITABH AVASTHI, IAS**

**REGISTRAR**

**SH. ANUPAM KUMAR (H.A.S)**

**DEAN (ACADEMIC)/ COE**

**PROF. (Dr.) RAJENDER GULERIA**

**FINANCE OFFICER**

**SH. UTTAM PATIAL, H.P.S.A.S.**

**ASSISTANT REGISTRAR (ACADEMIC)**

**Er. RAJIV VERMA**

**कर्मणि व्यञ्ज्यते प्रज्ञा**

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## **1. Introduction:**

The Government of Himachal Pradesh has established the Himachal Pradesh Technical University with the mandate to create excellent competent environment to impart the technical education across the State. The University has been established with the following objectives:-

- (a) To develop the knowledge of science, engineering and technology, management and environment by teaching, research, experimentation or practical training for the advancement of quality of life of the mankind.
- (b) To supply the required skilled manpower of appropriate kind and quality to meet the needs of society and national development plans.
- (c) To develop patterns of teaching and training at various levels of educational accomplishment so as to set high standards of education in science, engineering and technology.
- (d) To drive benefits from the ever growing scientific and technological knowledge in different parts of the world and to advance frontiers of knowledge by research, innovation, invention and product development.
- (e) To establish close linkage with Industry to make teaching, training and research in the University relevant to the needs of society and industry at national and international level.
- (f) To establish, maintain and manage colleges, schools, departments, centres of research and other institutions necessary to carry out the objects of the University.
- (g) To affiliate or recognize colleges or institutions within and outside the State of Himachal Pradesh.
- (h) To function as a leading resource Centre for knowledge management and entrepreneurship development in the area of Science and Technology.

## **2. Admission to technical and professional courses:**

- (a) Himachal Pradesh Technical University, Hamirpur, was established by Government of Himachal Pradesh under the State Legislative Act-16 of 2010.
- (b) Under the provision of Section-5 of the Himachal Pradesh Private Technical and Vocational Educational Institutions (Regulation of Admission and Fixation of Fee) Act, 2008, the State Government notified the eligibility criteria for admission in technical and professional courses from academic session 2018-19 in respect of the institutions as specified under Section -2 of the Act 2008.
- (c) Accordingly, the Himachal Pradesh Technical University (hereafter called as HPTU) will conduct Himachal Pradesh Common Entrance Test (hereafter called HPCET-2022) for admissions to B.Tech./B.Pharmacy MCA/MBA/MBA (T&HM) offered by HPTU and colleges affiliated to it, deemed to be University or other Universities established under the State Act or constituent units thereto.
- (d) The admission to all the courses shall be made on the basis of merit or rank/marks obtained in the National Level Entrance Test / HPCET-2022, subject to fulfillment of minimum educational qualification given under section 4.



### 3. Pattern:

#### 3.1 Mode of HPCET-2022:

- (a) Entrance examination (HPCET-2022) for each course shall be conducted in offline mode.
- (b) All questions shall be objective type multiple choice questions. The candidate will have to choose one correct answer only.
- (c) Two marks shall be awarded for each correct answer and 0.5 mark shall be deducted for each wrong answer (Applicable for B. Tech./B. Pharmacy/MBA/MBA(T&HM)/MCA courses).
- (d) While the candidate can skip a question but should not choose more than one option as correct answer.
- (e) The question paper for B. Tech & B. Pharmacy courses shall be common. However, candidate attempting Mathematics, Physics and Chemistry shall be eligible for admission to B.Tech or B. Pharmacy course whereas the candidate who will attempt Physics, Chemistry and Biology shall be eligible for admission to B. Pharmacy. The candidates are advised to go through eligibility criteria for admission mentioned in **Admission Brochure- 2022-23** which will be available on HPTU website *i.e.* [www.himtu.ac.in](http://www.himtu.ac.in) after the declaration of the result of HPCET-2022.

#### 3.2 Number of questions and duration of the examination:

- (i) **Bachelor of Technology, Bachelor of Pharmacy (Allopathy)**

Section	Subject	Number of question	Maximum marks	Duration
A	Physics	50	100	3 Hrs
B	Chemistry	50	100	
C	Mathematics/Biology	50	100	
Total		150	300	

- (vii) **Master of Computer Applications (MCA) and Master of Business Administration (MBA/ {MBA T&HM})**

Section	Subject	Number of questions	Maximum marks	Duration
A	Verbal Ability	25	50	2Hrs
B	Quantitative Ability	25	50	
C	Data Interpretation and Reasoning	25	50	
D	Business awareness (MBA& MBA (T&H))/ Computer Awareness (MCA)	25	50	
Total		100	200	

### 3.3 Syllabus:

The syllabus for appearing in different tests is given in Appendix (A to C) as indicated against the name of course below:

Sr. No.	Name of Course	Appendix
1.	B.Tech	A
2.	B. Pharmacy (Allopathy)	
3.	MCA	B
4.	MBA / MBA (T & HM)	C

### 3.4 Language of the question papers:

English shall be the language for all question papers of HPCET-2022.

### 4. Eligibility criteria:

The candidates appearing in HPCET-2022 for seeking admission to a particular course must fulfill the eligibility criteria for the corresponding course as per norms of All India Council of Technical Education (AICTE)/PCI/UGC or as applicable. The minimum eligibility criteria for the different courses are given in Table-1.

**Table -1: Minimum eligibility criteria for appearing in HPCET-2022**

Name of Course	Minimum eligibility for appearing in HPCET-2022
B.Tech (Direct Entry)	Passed/appeared 10+2 examination with Physics/ Mathematics /Chemistry/ Computer Science/Electronics/Information Technology/ Biology/Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/Entrepreneurship as per table1.3(a) ( As Annexure-D)  Obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together.  Or  Passed diploma (in Engineering and Technology) with at least 45% marks (40% for reserved category)subject to vacancies in the First Year, in case the vacancies at lateral entry are exhausted.
B. Pharmacy (Direct Entry)	Passed/appeared 10+2 or equivalent examination from a recognized Board or University with Physics and Chemistry as compulsory subjects along with one of the Mathematics/ Biology subject securing at least 45% marks (40% reserved category) in the above subjects taken together. Provided that a student should complete the age of 17 years on or before 31 <sup>st</sup> December of the year of admission to the course.
MBA/ MBA (T & HM)	Passed/appeared bachelor's degree from recognized University with minimum three years duration securing at least 50% marks (45% for reserved category) at the qualifying examination.



MCA	<p>Passed/Appeared B.C.A/ B.Sc. (Computer Science)/ B.Sc. (IT) / B.E. (CSE)/ B.Tech. (CSE) / B.E. (IT) / B.Tech. (IT) or equivalent Degree.</p> <p>OR</p> <p>Passed/Appeared any graduation degree (e.g.: B.E. / B.Tech. / B.Sc / B.Com. / B.A./ B. Voc./ etc.,) preferably with Mathematics at 10+2 level or at Graduation level.</p> <p>Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying examination.</p> <p>(For students having no Mathematics background compulsory bridge course will be framed by the respective University/ Institution and additional bridge courses related to computer subjects as per the norms of the concerned University).</p>
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- Note:-** (i) The candidates who are appearing for their final examination of 10+2 or bachelor degree examination in March/April, 2022 shall be eligible to appear in HPCET-2022 but the final selection is subject to satisfying the above eligibility criteria.
- (ii) In case the percentage of marks in the qualifying examination is in fractions, the same shall be rounded off to the nearest figure.

**5. Admission criteria:**

Admission to the above courses shall be made strictly on the basis of merit or rank/marks obtained in the National Level Entrance Test/HPCET-2022 subject to fulfillment of minimum educational qualification as mentioned in Table -1. **The Admission criteria and procedure including rules and regulations shall be available in the Admission Brochure 2022-22 which will be available on HPTU website :[www.himtu.ac.in](http://www.himtu.ac.in) after the declaration of HPCET-2022 result.**

**6. Seats available:**

The seats available in different affiliated Institutions in UG and PG courses for the academic year 2022-23, shall be specified in the Admission Brochure HPCET-2022. However, the tentative seats available are as per Appendix-c.

**7. Schedule of entrance examination:**

Sr. No.	Course	Date of Common Entrance Examination (HPCET-2022)	Tentative Date of Declaration of Result
1.	B. Tech (Direct Entry)	10.07. 2022 (09.00AM to 12:00 Noon)	20.07.2022
2.	B. Pharmacy (Direct Entry)	10.07. 2022 (09.00AM to 12:00 Noon)	20.07.2022
3	MCA	10.07. 2022 (09.00AM to 11:00 A.M.)	20.07.2022
4	MBA/MBA (T&HM)	10.07. 2022 (02:00 PM to 04:00 PM)	20.07.2022

**8. Examination centres:**

**Examination centre for : B. Tech., B. Pharmacy (Allopathy), MBA, MBA (T&H) & MCA**

Bilaspur	Mandi	Kullu
Chamba	Shimla	Sirmour
Kangra	Solan	Una
Hamirpur	Chandigarh	

**Note: University reserves the right to create or change or cancel any examination centre without prior information depending upon the number of candidates.**

**9. Application form:**

- All candidates have to apply online on the prescribed application form available on the University website i.e. [www.himtu.ac.in](http://www.himtu.ac.in).
- The candidates must fill the application form in all respect carefully and check the same before submitting it.
- Incomplete application form shall not be considered and no correspondence shall be made in this regard.
- The application form once submitted can neither be taken back under any circumstances nor shall the application fee deposited be refunded in any case.
- Any application submitted after the prescribed last date will not be accepted.
- The applicants are required to pay the non-refundable entrance examination fee as mentioned under section 10.

**10. Entrance examination fee:**

- Non-refundable entrance examination fee for different categories is as under:

Sr. No	Course	Entrance Exam. Fee in Rs.		Remarks
		SC/ST /BPL	Other than SC/ST/BPL	
1	B.Tech	1400	1550	<b>Fee once paid shall not be refunded in any case</b>
2	B. Pharmacy (Allo)	1400	1550	
3	B.Tech. & B. Pharmacy both	2800	3100	
4	MCA	1400	1550	
5	MBA	1400	1550	
6	MBA Tourism	1400	1550	
7	MBA & MBA Tourism both	2800	3100	

- In case entrance examination fee is paid through e-Challan/ credit/debit card, the candidate is required to pay an additional processing charges to the bank, *if any*, as per the bank norms.
- Fee once paid shall not be refunded in any case. However double payment, if any, shall be refunded in the account of the candidate, for which the candidate has to apply separately to the Finance Officer, H.P. Technical University Hamirpur.

**11. e -Admit card:**

- The e-admit card duly signed by Controller of Examinations (COE) will be made available to candidates on the University website, i.e., [www.himtu.ac.in](http://www.himtu.ac.in). The candidates should download e-admit card by entering the application form number/ date of birth.

- (b) The e-admit card will contain the e-admit card number, photograph of the student, address of the examination centre and examination date. Discrepancies, if any, must be brought to the notice of the Controller of Examinations, Himachal Pradesh Technical University, VPO Daruhi, Distt. Hamirpur (H.P.)-177001 immediately.
- (c) Candidates should take a print of the e-admit card using the print option on A-4 size paper only. Please ensure that all information on the e-admit card including photograph is clearly visible on the print and e-admit card are duly signed by COE.
- (d) Candidates will not be permitted to appear for the written test without valid e-admit card.
- (e) Candidates must not mutilate e-admit card or change any entry made therein after it has been authenticated and received by them. Impersonation is a legally punishable offence.
- (f) The e-admit card is an important document and it must be preserved and produced at the time of entrance examination/test. **Candidate should report to the allotted examination centre along with e-admit card and ID proof like aadhar card etc. at least half an hour before the commencement of examination.**

**12. Answer key and declaration of result**

- (a) The answer key for the courses of HPCET-2022 shall be made available on the University website on the respective dates of HPCET-2022.
- (b) Candidates can forward their written complaints, *if any*, along with supporting documents/solution pertaining to question paper/answer key which must reach in the office of the Controller of Examinations, H.P. Technical University, Gandhi Chowk, Hamirpur (H.P.)-177001 within two days of conduct of respective examinations by 5:00 PM either personally or through e-mail [coehimtu@gmail.com](mailto:coehimtu@gmail.com). No complaint of any kind, in this regard, shall be entertained after the due date and time.

**13. Procedure to resolve tie:**

Himachal Pradesh Technical University will follow the below mentioned rules to break the tie, if any, in ranking procedure if the candidates have scored the same aggregate marks in HPCET-2022 or qualifying examination.

**(a) B. Tech./ B. Pharmacy- Direct Entry:**

- (i) If two applicants have the same HPCET- 2022 aggregate marks, the candidate with higher marks in Physics will be ranked above.
- (ii) If the marks in Physics are same, then higher marks in Chemistry would break the tie.
- (iii) If the marks in Physics and Chemistry are same, then the marks in third subject would eventually be same. The qualifying examination *i.e.* 10+2 marks would break the tie and it will be done during counseling there and then if the qualifying examination marks are not available in the HPCET-2022 application form.
- (iv) If the qualifying examination marks are also same then the date of birth of the applicants will be considered. Elder candidate shall get the benefit of being ranked above.

**(g) M.B.A/ MBA (T & HM) & M.C.A (Direct Entry):**

- (i) If two applicants have the same HPCET -2022 aggregate marks, the candidate with higher marks in Verbal Ability (section-A) will be ranked above.
- (ii) If the marks in Verbal Ability are same, then a higher Quantitative Ability (section -B) marks would break the tie.
- (iii) If the Quantitative Ability marks are same, then a higher Data Interpretation and Reasoning (section-C) marks would break the tie.
- (iv) If the Verbal Ability, Quantitative Ability and Data Interpretation and Reasoning marks are same, then the fourth subject General Knowledge and Business Awareness marks would eventually be the same. The qualifying examination *i.e.* graduation marks would break the tie and it will be done during counseling there and then if the qualifying examination marks are not available in the HPCET-2022 application form.
- (v) If the qualifying examination marks are also same then the date of birth of the applicants will be considered. Elder candidate shall get the benefit of being ranked above.

**14. Result:**

The result of HPCET-2022 will be uploaded on the University website *i.e.* [www.himtu.ac.in](http://www.himtu.ac.in) on or before (20.07.2022 for UG & PG Courses) and will also be available on the Notice Board of the University. The result of each candidate will be provisional. The candidates are advised to download their result card from the University website for producing the same at the time of counseling.

**15. Instructions for candidates for strict compliance:**

- (a) Candidates shall maintain complete silence and attend to their question paper only. Any conversation or gesture or disturbance in the examination room/hall shall be deemed as misbehavior. If a candidate is found using unfair means or impersonating, his/her candidature shall be cancelled and he/she will be liable to be debarred for taking test either permanently or for a specified period according to the nature of offence.
- (b) Candidates are not allowed to carry any textual material, calculators, document, slide rules, log tables, electronic watches with facilities of scientific calculator, printed or written material, bits of papers, mobile phone, pager or any other device, except the e-admit card, geometry box, pencils, erasers, cardboard or a clip board and ball point pens (black/blue) inside the examination room/hall. If any candidate is in possession of any of the above items, his/her candidature will be treated as unfair means and his/her examination/test will be cancelled & he/she will also be debarred for future test(s) & the equipment will be seized.
- (c) **Candidates are advised to attempt only those subjects which he/she had filled in the application form. If a candidate attempts wrong subject combination, his/her candidature shall liable to be cancelled and no correspondence shall be entertained in this regard.**



- (d) The candidate shall not remove any page(s) from the test booklet (in case of pen and paper based test) and if he/she is found to have removed any page(s) from his/her test booklet, he/she will be presumed to have used unfair means and shall be liable for criminal action.

**16. Guidelines for candidates to appear:**

- (a) Please check the e-admit card carefully for your name, centre allotted, place and category.
- (b) The e-admit card is issued provisionally to the candidate subject to his/her satisfying the eligibility conditions.
- (c) The examination rooms/hall will be opened thirty minutes before the commencement of the examination/test. Candidates should take their seats immediately after opening of the examination hall. If the candidates do not report in time, they are likely to miss some of the general instructions to be announced in the examination hall.
- (d) **The candidate must show, on demand, the e-admit card and ID proof for admission in the examination room/hall. A candidate who does not possess the e-admit card duly electronically signed by Controller of Examinations shall not be permitted to appear in examination/test under any circumstances.**
- (e) For aptitude test, candidates are advised to bring their own geometry box, pencils and erasers.
- (f) Candidates are advised to bring with them a cardboard or a clip board on which nothing should be written, so that they have no difficulty in filling responses in the OMR sheet even if the tables provided in the examination room/hall do have smooth surface. They should also bring with them their own ball point pens (black/blue) of good quality.
- (g) No candidate shall be allowed to carry any baggage inside the examination hall.
- (h) No candidate, without the special permission of the Centre Superintendent or Invigilator concerned, will leave his/her seat or examination room until complete duration of examination.
- (i) Use of electronic devices like mobile phone, calculator etc. is not permitted in the entrance examination. Materials like log table, book, notebook, etc. should not be brought into the examination hall.
- (j) The candidates are directed not to fold or mutilate the OMR sheet because these are to be checked by machine. Any OMR sheet, if found fold or mutilated, may not be scanned by the computer and result of such candidate shall not be declared.
- (k) The candidate shall handover the OMR sheet to the Centre Supdt./Asstt. Superintendent on duty before leaving the examination hall. However, the candidates are allowed to carry question booklet along with them.
- (l) For each question four alternate answers will be available. The candidate has to darken only one circle using black/blue ball pen as correct answer.



(m) The correct method of marking answers is indicated below:

- (i) Each question will be followed by answers marked as (a), (b), (c) or (d). Select the most appropriate answer. Then using blue/black ball-pen blackens the circle bearing the correct answer index against the serial number of the question on the OMR sheet completely. For example, if the answer to question 2 is c, it is marked as follows:

Question 2      ☐ a      ☐ b      ☒ c      ☐ d

- (ii) Some wrong methods of marking a answers:

Please do not mark your answer or fill up information by using any of the following methods of marking

(Use of Tick Mark)      ✓      (Use of Cross Mark)      ☐ x  
(Half Filled Circle)      ☐      (Use of Dot)      ☐ •

- (iii) Please note that the mark should be dark enough and the circle should be filled in as completely as possible. You need not to make special efforts to darken any circle artistically.

## 17. Instructions for submission of application form online:

### Instructions for submission of application form online:

#### (a) General instructions:

- (i) Candidates can submit online application form to seek admission in a particular course(s) through the concerned link available in admission tab on the University website <http://www.himtu.ac.in>
- (ii) Fill in the application form only if you meet the eligibility criteria for a particular course as per HPTU norms.
- (iii) Information Brochure for HPCET-2022 (Part-I) has already been uploaded on University website which contains all the necessary information and instructions.
- (iv) The candidates are advised to read the instructions carefully before filling & finally submitting the application form. The instructions are self-explanatory and candidates are required to follow them strictly.
- (v) Incomplete online application forms, without fee & its final submission and timely generation of PDF of application form will be rejected straightway. No correspondence in this regard shall be entertained.
- (vi) Himachal Pradesh Technical University does not take any responsibility for delay or loss of material during post/transit.
- (vii)

(b) **Detailed instructions:**

- (i) Fresh registration shall be started *w.e.f.* **21<sup>st</sup> April 2022.**
- (ii) The candidates are advised to retain PDF copy of HPCET-2022 application form with them, candidates need not to send it to the University. Do not forget to write the Application Form Number in HPCET-2022 related future correspondence. You can send HPCET-2022 correspondence / clarifications at email ID [himtuadmission@gmail.com](mailto:himtuadmission@gmail.com)
- (iii) The candidate must pay prescribed entrance examination fee.
- (iii) For better accuracy please use only latest version of mozilla firefox or internet explorer. **Don't use mobile phone and goggle chrome browser**
- (iv) Clear the temporary internet files and cookies before filling up each form.
- (v) Fill up the application form at a suitable time and from a location where you have good accessibility of internet with suitable bandwidth available.
- (vi) Do not open more than one session at the same time on the same computer while filling the online form. *i.e.* do not fill more than one form at the same time on the same computer even if you are filling the two applications using different browsers or different tabs of the same browser.
- (vii) You are required to have a scanned copy of your coloured photograph (3.5 x 4.5 cm) and digital signatures. The scanned copies of coloured photo (3.5 x 4.5 cm) in (JPEG /JPG) format and signature (in \*.JPEG /\*.JPG) format are required to be uploaded during the online submission of application form. The file size of photograph and signatures in any case shall not exceed 50kb and 30kb for each file separately.
- (viii) It is mandatory to provide your cell number and email address as it will be used for registration and by the admission office for any communication related to your admission.

(c) **Instructions for online submission:**

**Step 1: Registration:**

- (a) Open the web-site <http://www.himtu.ac.in> and click the link "Application Form for HPCET-2022" available in menu "Online Admission Form" under the Tab "Admission" in HPTU website. Ensure that you have downloaded the Information Brochure HPCET-2022, read carefully all the instructions contained in the Information Brochure HPCET-2022 and instructions displayed after clicking on "Click Here to Apply for HPCET-2022" button.
- (b) If you have read the Information Brochure HPCET-2022 and instructions. Tick the Check Box "I have downloaded the information bulletin and read all the instructions" and click on the button "Proceed to Applying Online". Account Registration Form will appear. Enter the essential information against Name (Exactly as per 10<sup>th</sup> Certificate), User Name (The Username must be unique, the candidates are advised to use some special character during making entry in the Username) Enter the Password, Confirm password, Date of Birth, valid email address and alive mobile number. After entering the information, click on "Create Account" button. The system will generate a Unique Form Number which will be displayed in the popup menu on the screen and the credential created by the system against this application/form will also be sent on the registered email entered during the registration process. The candidates are advised to note down the Application/Form Number, User Name & Password for future reference.

## Step 2: Login:

Click the “login” button. Fill the Username, Password and Application Form Number. Online Application Form will appear. The form has been divided into six tabs i.e Basic Detail, Verify Email, Upload Photo and Signature, Fee Payment & Payment Detail Confirmation. After successfully submission of each webpage of application form, next page will be opened automatically.

### Basic Detail:

- (a) **Name of the candidate:** Name of the candidate as filled up during the registration will automatically appear.
- (b) **Father's name:** Write your father's name in capital letters as it appears in your 10<sup>th</sup> certificate or first Board/University Examination certificate.
- (c) **Mother's name:** Write your mother's name in capital letters as it appears in your 10<sup>th</sup> certificate or first Board/University Examination Certificate.
- (d) **Aadhaar number:** Write your 16 digits aadhaar number.
- (e) **Nationality:** Select the appropriate option - *Indian/ Other*, whichever is applicable.
- (f) **Sex:** Select the appropriate option - *Male/ Female/ Other*, whichever is applicable.
- (g) **Programme applied for:** The candidates who are eligible and want to apply for two tests simultaneously i.e. B.Tech & B. Pharmacy(Allo.), MBA & MBA in Tourism and Hospitality Management must select the appropriate value from, *Bachelor of Technology and B.Pharmacy (Allopathy) both*, *MBA and MBA in Tourism and Hospitality Management (both)* from the dropdown menu “Programme applied for” and have to pay double application processing fee as applicable. The candidates are advised to do not fill the separate applications for the above mentioned programmes to avoid inconvenience of allotment of examination centres, roll numbers, and conduct of examinations on same date and time. select the appropriate option from the dropdown for which you want to apply:
  - Bachelor of Technology
  - Bachelor of Pharmacy(Allopathy)
  - Bachelor of Technology and B.Pharmacy (Allopathy) both
  - Master of Business Administration
  - MBA in Tourism and Hospitality Management
  - MBA and MBA in Tourism and Hospitality Management ( both)
  - Master of Computer Applications
- (h) **Examination Centre:** Select the convenient Examination Centre from the dropdown menu.
- (i) **Bonafide/Domicile of Himachal:** Select the appropriate *Yes/No* option, whichever is applicable.
- (j) **Category:** Select appropriate category - *GEN/ SC/ ST/ OBC*, whichever is applicable.
- (k) **Sub-category:** Tick on the applicable checkbox(es) if you belong to BPL, Physically challenged, Sports and Freedom Fighter. The candidate must have the valid sub-category certificate(s) issued by the competitive authority, otherwise keep it unticked.
- (l) **Date of birth, valid e-mail id and alive mobile number:** The data in these fields will automatically appear as you have filled it during the registration of this form.
- (m) **Beti Hai Anmol (Single Girl Child), Kashmiri Migrants, Quota under which applied** etc. The candidate have to make the appropriate selection for the fields *Beti Hai Anmol (Single Girl Child), Kashmiri Migrants, Quota Under Which Applied*. On selection of *All India Quota*, the fields *Bonafied / domicile of Himachal, Sub-category, Defence, Backward Area, Tuition Fee Waiver* etc. become disabled.



- (n) **Defence :** Select the appropriate *Yes/No* option. On selection of *Yes*, the field *Weightage code for Defence* will be enabled. The candidate/ward of defence personnel have to select appropriate value from *Deceased in war/action, Disabled during war/action, Death attribute to military service, Disabled during service from the dropdown Weightage code for Defence, Gallantry Awardee during war/action, Ex-servicemen or personnel in service.*
- (o) **Backward Area:** Select the appropriate *Yes/No* option. On selection of *yes*, the field *Weightage code for Backward Area* will be enabled and the candidate have to select appropriate value from *At least two examinations from the schools located in the backward area, At least one examinations from the schools located in the backward area, Two examinations from the schools located in the immediately adjoining backward area, One examination from the schools located in the immediately adjoining backward area, Not passed any examination from backward area but belong to the backward area.*
- (p) **Tuition Fee Waiver Scheme :** Select the appropriate *Yes/No* option. On selection of *Yes*, the field “*If Yes then in which Category*” will be enabled and the candidate have to select appropriate value from *IRDP,BPL, Antodaya, Orphan and other.* The candidate must have a valid certificate issued by the competitive authority.
- (q) **Qualifying Exam. or it's equivalent:** Select the qualifying exam or its equivalent- *10+2(Medical)/10+2(NM)/B.Tech/B.Pharmacy/BA/B.Sc/B.Com/BBA/BCA/B.Sc. (IT/Computer Science)/ any other-whichever is applicable.*
- (r) **Result:** Then select the *Passed/Appeared* option as applicable. On selection of *passed*, the candidate has to enter his/her %age of marks scored in the qualifying examination. The candidates who have appeared in the qualifying examination can also appear in HPCET subject to fulfil the eligibility and admission criteria during the admission process.
- (s) **Percentage in qualifying examination or its equivalent:** On selection of “*Passed*” from the dropdown *Qualifying exam. or it's equivalent*, the candidate has to fill his/her %age of marks scored in the qualifying examination which must be greater or equal to the %age of marks as mentioned in the eligibility criteria.
- (t) **Permanent address:** Enter your permanent address. The address must include your Name, Father's name, Village, Post office, Tehsil, District including the PIN Code.
- (u) **Correspondence address:** Enter your postal address for communication. The address must include your name, c/o name if required, etc. including the PIN Code.

### Step 3: Verify email:

The email address as entered by the candidate during the registration of the form will automatically appear. The candidate can edit his / her wrongly entered email ID. The system generated OTP will be sent to the candidate's email ID on clicking the button “Send OTP on Email”. On entering a valid OTP, you will see the webpage message of **Email verified successfully**. Next tab **UPLOAD PHOTOGRAPH/ SIGNATURE** will appear on the screen.

### Step 4: Upload photograph and signature:

- (a) **Photograph:** Click on **browse** to select your latest scanned photograph and select the file size upto 50kb of \*.JPEG/\*.JPG format from the source.
- (b) **Signature:** Upload the JPEG/.JPG format file by browsing the source and select your latest digital signatures of file size upto 30kb.

**After attaching all the files, click on “Upload” button.** You will see the webpage message on the screen **Documents are uploaded successfully**. The next page confirmation will appear automatically.

### Step 5: Confirmation:

Thereafter, filled application form under the “**Confirmation**” button will appear. At the bottom of the application form two options i.e. “**Edit**” and “**Submit and Go For Payment**” shall be there. In case, you intend to make correction displayed on the confirmation page, click on “**Edit**” button. The data filled by you will appear in editable form. Make the necessary correction and click on “**Update Details**” button to save the changes. You will see the webpage message of **updated successfully** on the screen. Now click the “**Submit and Go For Payment**” button. A webpage message will be displayed on the screen that you will not be able to edit any part of the information after click “**OK**” button. Click **CANCEL** button if you do not want to finally submit your form right now. On click on “**OK**” button, a webpage message “**Your Form has been submitted successfully**” will be displayed on the screen. It may be ensured before you click the “**OK**” button that all the applicable fields have been filled correctly and no change will occur after final submission.

### Step 6: Make fee payment:

- (a) Click the “**Click here to get Fee Payment Link**” Button; the option to make online fee payment will appear, Click the button “Click here to Fee payment ”. Before proceeding further read the “**Terms & Conditions**” carefully and choose a payment method from HDFC Credit/Debit Card, Other Credit /Other Debit Card, Net banking then select Debit/Credit Type i.e. Visa Debit Cards (All Banks), MasterCard Debit Cards (All Banks), Other Maestro Card and make necessary entries of Card Number, Name of the Card, CVV Number & expiry date etc. click on “**Pay Now**” button. You will be automatically redirected to your bank website. After successful transaction the web page will automatically redirected to university website <http://www.himtu.ac.in> If you opt the fee payment method “**Net Banking**” you have to select the name of the bank from the dropdown menu and have to enter your bank Login Id and password, make the necessary entries in the payment form of the concerned bank. Click on “**Pay Now**” button. You will be automatically redirected to your bank website. After successful transaction, the page will be redirected to the University website and the system will generate the PDF of the application form.
- (b) In case your fee has been debited from your account and you are not able to get the PDF, you may send the payment detail such as Application/form number, amount of payment made, transaction number and date of payment on email ID: [doshptu@gmail.com](mailto:doshptu@gmail.com) The candidates are requested to contact at online application helpline number: **01972-226914** for the confirmation of fee and generation of PDF of Application Form.
- (c) Kindly avoid to make multiple payments against the same Application/Form Number. If the multiple payments against the same application/form number is made by the candidate, the candidate may fill the refund form which will be made available on the University website after the close of HPCET application process. Filled refund form must be send through email at: [finofficerhimtu@gmail.com](mailto:finofficerhimtu@gmail.com) and have to wait for atleast one month to complete the refund process by the University.

Thereafter, screen will display the full details as entered by you in the Application Form alongwith declaration. The candidates must retain the PDF copy of HPCET-2022 application form with them and no need to submit/send it to the University through email or by post. The candidates are advised to write down the Application Form Number and do not forget it to mention the HPCET-2022 Application Number in HPCET related future correspondence. You can send HPCET-2022 correspondence/clarifications at email ID “[deanmgmthptu@gmail.com](mailto:deanmgmthptu@gmail.com)”.

### Important Note:

- HPTU reserves its right to alter or modify the Information Brochure HPCET-2022.
- All correspondence related to HPCET-2022 should be addressed to the Controller of Examinations, Himachal Pradesh Technical University Hamirpur (H.P.)– 177001. The Application Number printed on the computer generated application form (PDF) must be mentioned in all such correspondences.



**HCET-2022 Syllabus for B. Tech./ B. Pharmacy****MATHEMATICS****UNIT 1: SETS, RELATIONS AND FUNCTIONS:**

Sets and their representation; Union, intersection and complement of sets and their algebraic properties; Power set; Relation, Types of relations, equivalence relations, functions; one-one, into and onto functions, composition of functions.

**UNIT 2: COMPLEX NUMBERS AND QUADRATIC EQUATIONS:**

Complex numbers as ordered pairs of reals, Representation of complex numbers in the form  $a+ib$  and their representation in a plane, Argand diagram, algebra of complex numbers, modulus and argument (or amplitude) of a complex number, square root of a complex number, triangle inequality, Quadratic equations in real and complex number system and their solutions. Relation between roots and co-efficients, nature of roots, formation of quadratic equations with given roots.

**UNIT 3: MATRICES AND DETERMINANTS:**

Matrices, algebra of matrices, types of matrices, determinants and matrices of order two and three. Properties of determinants, evaluation of determinants, area of triangles using determinants. Adjoint and evaluation of inverse of a square matrix using determinants and elementary transformations, Test of consistency and solution of simultaneous linear equations in two or three variables using determinants and matrices.

**UNIT 4: PERMUTATIONS AND COMBINATIONS:**

Fundamental principle of counting, permutation as an arrangement and combination as selection, Meaning of  $P(n,r)$  and  $C(n,r)$ , simple applications.

**UNIT 5: MATHEMATICAL INDUCTION:**

Principle of Mathematical Induction and its simple applications.

**UNIT 6: BINOMIAL THEOREM AND ITS SIMPLE APPLICATIONS:**

Binomial theorem for a positive integral index, general term and middle term, properties of Binomial coefficients and simple applications.

**UNIT 7: SEQUENCES AND SERIES:**

Arithmetic and Geometric progressions, insertion of arithmetic, geometric means between two given numbers. Relation between A.M. and G.M. Sum upto  $n$  terms of special series:  $S_n$ ,  $S_{n^2}$ ,  $S_{n^3}$ . Arithmetic - Geometric progression.

**UNIT 8: LIMIT, CONTINUITY AND DIFFERENTIABILITY:**

Real - valued functions, algebra of functions, polynomials, rational, trigonometric, logarithmic and exponential functions, inverse functions. Graphs of simple functions. Limits, continuity and differentiability. Differentiation of the sum, difference, product and quotient of two functions. Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions; derivatives of order upto two. Rolle's and Lagrange's Mean Value Theorems. Applications of derivatives: Rate of change of quantities, monotonic - increasing and decreasing functions, Maxima and minima of functions of one variable, tangents and normals.

**UNIT 9: INTEGRAL CALCULUS:**

Integral as an anti - derivative. Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities.

**Evaluation of simple integrals of the type**

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{a^2 - x^2}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c},$$

$$\int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{(px+q)dx}{ax^2 + bx + c}, \int \frac{(px+q)dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \sqrt{a^2 \pm x^2} dx \quad \int \sqrt{x^2 - a^2} dx$$

Integral as limit of a sum. Fundamental Theorem of Calculus. Properties of definite integrals. Evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form.

**UNIT 10: DIFFERENTIAL EQUATIONS:**

Ordinary differential equations, their order and degree. Formation of differential equations. Solution of differential equations by the method of separation of variables, solution of homogeneous and linear differential equations of the type:

$$\frac{dy}{dx} + p(x)y = q(x)$$

**UNIT 11: CO-ORDINATE GEOMETRY:**

Cartesian system of rectangular co-ordinates in a plane, distance formula, section formula, locus and its equation, translation of axes, slope of a line, parallel and perpendicular lines, intercepts of a line on the coordinate axes.

## **Straight lines**

Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, distance of a point from a line, equations of internal and external bisectors of angles between two lines, coordinates of centroid, orthocentre and circumcentre of a triangle, equation of family of lines passing through the point of intersection of two lines.

## **Circles, conic sections**

Standard form of equation of a circle, general form of the equation of a circle, its radius and centre, equation of a circle when the end points of a diameter are given, points of intersection of a line and a circle with the centre at the origin and condition for a line to be tangent to a circle, equation of the tangent. Sections of cones, equations of conic sections (parabola, ellipse and hyperbola) in standard forms, condition for  $y = mx + c$  to be a tangent and point (s) of tangency.

### **UNIT 12: THREE DIMENSIONAL GEOMETRY:**

Coordinates of a point in space, distance between two points, section formula, direction ratios and direction cosines, angle between two intersecting lines. Skew lines, the shortest distance between them and its equation. Equations of a line and a plane in different forms, intersection of a line and a plane, coplanar lines.

### **UNIT 13: VECTOR ALGEBRA:**

Vectors and scalars, addition of vectors, components of a vector in two dimensions and three dimensional space, scalar and vector products, scalar and vector triple product.

### **UNIT 14: STATISTICS AND PROBABILITY:**

Measures of Dispersion: Calculation of mean, median, mode of grouped and ungrouped data calculation of standard deviation, variance and mean deviation for grouped and ungrouped data.

Probability: Probability of an event, addition and multiplication theorems of probability, Baye's theorem, probability distribution of a random variate, Bernoulli trials and Binomial distribution.

### **UNIT 15: TRIGONOMETRY:**

Trigonometrical identities and equations. Trigonometrical functions. Inverse trigonometrical functions and their properties. Heights and Distances.

### **UNIT 16: MATHEMATICAL REASONING:**

Statements, logical operations and, or, implies, implied by, if and only if. Understanding of tautology, contradiction, converse and contrapositive.

## **PHYSICS**

**The syllabus contains two Sections - A and B. Section - A pertains to the Theory Part having 80% weightage, while Section - B contains Practical Component (Experimental Skills) having 20% weightage.**

### **SECTION - A**

#### **UNIT 1: PHYSICS AND MEASUREMENT**

Physics, technology and society, S I units, Fundamental and derived units. Least count, accuracy and precision of measuring instruments, Errors in measurement, Dimensions of Physical quantities, dimensional analysis and its applications.

#### **UNIT 2: KINEMATICS**

Frame of reference. 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, position-time graphs, relations for uniformly accelerated motion. Scalars and Vectors, Vector addition and Subtraction, Zero Vector, Scalar and Vector products, Unit Vector, Resolution of a Vector. Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion.

#### **UNIT 3: 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. Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces.

Static and Kinetic friction, laws of friction, rolling friction.

Dynamics of uniform circular motion: Centripetal force and its applications.

#### **UNIT 4: WORK, ENERGY AND POWER**

Work done by a constant force and a variable force; kinetic and potential energies, work-energy theorem, power.

Potential energy of a spring, conservation of mechanical energy, conservative and nonconservative forces; Elastic and inelastic collisions in one and two dimensions.

#### **UNIT 5: ROTATIONAL MOTION**

Centre of mass of a two-particle system, Centre of mass of a rigid body; Basic concepts of rotational motion; moment of a force, torque, angular momentum, conservation of angular momentum and its applications; moment of inertia, radius of gyration. Values of moments of inertia for simple geometrical



objects, parallel and perpendicular axes theorems and their applications. Rigid body rotation, equations of rotational motion.

#### **UNIT 6: GRAVITATION**

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's laws of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

#### **UNIT 7: PROPERTIES OF SOLIDS AND LIQUIDS**

Elastic behaviour, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity. Pressure due to a fluid column; Pascal's law and its applications. Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension - drops, bubbles and capillary rise. Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer-conduction, convection and radiation, Newton's law of cooling.

#### **UNIT 8: THERMODYNAMICS**

Thermal equilibrium, zeroth law of thermodynamics, concept of temperature. Heat, work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.

#### **UNIT 9: KINETIC THEORY OF GASES**

Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases - assumptions, concept of pressure. Kinetic energy and temperature: rms speed of gas molecules; Degrees of freedom, Law of equipartition of energy, applications to specific heat capacities of gases; Mean free path, Avogadro's number.

#### **UNIT 10: OSCILLATIONS AND WAVES**

Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring - restoring force and force constant; energy in S.H.M. - kinetic and potential energies; Simple pendulum - derivation of expression for its time period; Free, forced and damped oscillations, resonance.

Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect in sound

#### **UNIT 11: ELECTROSTATICS**

Electric charges: Conservation of charge, Coulomb's law-forces between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field: Electric field due to a point charge, Electric field lines, Electric dipole, Electric field due to a dipole, Torque on a dipole in a uniform electric field.

Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential and its calculation for a point charge, electric dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges in an electrostatic field.

Conductors and insulators, Dielectrics and electric polarization, capacitor, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, Energy stored in a capacitor.

#### **UNIT 12: CURRENT ELECTRICITY**

Electric current, Drift velocity, Ohm's law, Electrical resistance, Resistances of different materials, V-I characteristics of Ohmic and nonohmic conductors, Electrical energy and power, Electrical resistivity, Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance.

Electric Cell and its Internal resistance, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and their applications. Wheatstone bridge, Metre bridge. Potentiometer - principle and its applications.

#### **UNIT 13: MAGNETIC EFFECTS OF CURRENT AND MAGNETISM**

Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields. Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in 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. Bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro- magnetic substances.

Magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.

#### **UNIT 14: ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS**

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance. Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LCR series circuit, resonance; Quality factor, power in AC circuits, wattless current. AC generator and transformer.

#### **UNIT 15: ELECTROMAGNETIC WAVES**

Electromagnetic waves and their characteristics. Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, Xrays, gamma rays). Applications of e.m. waves.

#### **UNIT 16: OPTICS**

Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a Lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers.

Wave optics: wavefront and Huygens' principle, Laws of reflection and refraction using Huygen's principle. 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. Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroids.

#### **UNIT 17: DUAL NATURE OF MATTER AND RADIATION**

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light. Matter waves-wave nature of particle, de Broglie relation. Davisson-Germer experiment.

#### **UNIT 18: ATOMS AND NUCLEI**

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

#### **UNIT 19: ELECTRONIC DEVICES**

Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; 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). Transistor as a switch.

#### **UNIT 20: COMMUNICATION SYSTEMS**

Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation, Need for modulation, Amplitude and Frequency Modulation, Bandwidth of signals, Bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only).

### **SECTION -B**

#### **UNIT 21: EXPERIMENTAL SKILLS**

Familiarity with the basic approach and observations of the experiments and activities:

1. Vernier callipers-its use to measure internal and external diameter and depth of a vessel.
2. Screw gauge-its use to determine thickness/diameter of thin sheet/wire.
3. Simple Pendulum-dissipation of energy by plotting a graph between square of amplitude and time.
4. Metre Scale - mass of a given object by principle of moments.
5. Young's modulus of elasticity of the material of a metallic wire.
6. Surface tension of water by capillary rise and effect of detergents.
7. Co-efficient of Viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
8. Plotting a cooling curve for the relationship between the temperature of a hot body and time.
9. Speed of sound in air at room temperature using a resonance tube.
10. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
11. Resistivity of the material of a given wire using metre bridge.
12. Resistance of a given wire using Ohm's law.
13. Potentiometer -
  - (i) Comparison of emf of two primary cells.
  - (ii) Determination of internal resistance of a cell.



14. Resistance and figure of merit of a galvanometer by half deflection method.
15. Focal length of:
  - (i) Convex mirror
  - (ii) Concave mirror, and
  - (iii) Convex lens
 using parallax method.
16. Plot of angle of deviation vs angle of incidence for a triangular prism.
17. Refractive index of a glass slab using a travelling microscope.
18. Characteristic curves of a p-n junction diode in forward and reverse bias.
19. Characteristic curves of a Zener diode and finding reverse break down voltage.
20. Characteristic curves of a transistor and finding current gain and voltage gain.
21. Identification of Diode, LED, Transistor, IC, Resistor, Capacitor from mixed collection of such items.
22. Using multimeter to:
  - (i) Identify base of a transistor
  - (ii) Distinguish between npn and pnp type transistor
  - (iii) See the unidirectional flow of current in case of a diode and an LED.
  - (iv) Check the correctness or otherwise of a given electronic component (diode, transistor or IC).

## **CHEMISTRY**

### **SECTION: A**

#### **PHYSICAL CHEMISTRY**

#### **: SOME BASIC CONCEPTS IN CHEMISTRY**

Matter and its nature, Dalton's atomic theory; Concept of atom, molecule, element and compound; Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis; Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae; Chemical equations and stoichiometry.

#### **: STATES OF MATTER**

Classification of matter into solid, liquid and gaseous states.

##### **Gaseous State:**

Measurable properties of gases; Gas laws - Boyle's law, Charles's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of

Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates); Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal behaviour, compressibility factor and van der Waals equation.

##### **Liquid State:**

Properties of liquids - vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).

##### **Solid State:**

Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications; Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; Electrical and magnetic properties.

#### **UNIT 3: ATOMIC STRUCTURE**

Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of hydrogen atom, Bohr model of hydrogen atom - its postulates, derivation of the relations for energy of the electron and radii of the different orbits, limitations of Bohr's model; Dual nature of matter, de-Broglie's relationship, Heisenberg uncertainty principle. Elementary ideas of quantum mechanics, quantum mechanical model of atom, its important features. Concept of atomic orbitals as one electron wave functions; Variation of  $\psi$  and  $\psi^2$  with  $r$  for 1s and 2s orbitals; various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance; shapes of s, p and d - orbitals, electron spin and spin quantum number; Rules for filling electrons in orbitals - aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.

#### **UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE**

Kossel - Lewis approach to chemical bond formation, concept of ionic and covalent bonds.

**Ionic Bonding:** Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

**Covalent Bonding:** Concept of electronegativity, Fajan's rule, dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.

**Quantum mechanical approach to covalent bonding:** Valence bond theory - Its important features, concept



of hybridization involving s, p and d orbitals; Resonance.

**Molecular Orbital Theory** - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy.

Elementary idea of metallic bonding. Hydrogen bonding and its applications.

#### UNIT 5: CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes.

**First law of thermodynamics** - Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity; Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.

**Second law of thermodynamics**; Spontaneity of processes;  $\Delta S$  of the universe and  $\Delta G$  of the system as criteria for spontaneity,  $\Delta G^\circ$  (Standard Gibbs energy change) and equilibrium constant.

#### UNIT 6: SOLUTIONS

Different methods for expressing concentration of solution - molality, molarity, mole fraction, percentage (by volume and mass both), vapour pressure of solutions and Raoult's Law - Ideal and non-ideal solutions, vapour pressure - composition, plots for ideal and non-ideal solutions; Colligative properties of dilute solutions - relative lowering of vapour pressure, depression of freezing point, elevation of boiling point and osmotic pressure; Determination of molecular mass using colligative properties; Abnormal value of molar mass, van't Hoff factor and its significance.

#### UNIT 7: EQUILIBRIUM

Meaning of equilibrium, concept of dynamic equilibrium.

**Equilibria involving physical processes**: Solid-liquid, liquid - gas and solid - gas equilibria, Henry's law, general characteristics of equilibrium involving physical processes.

**Equilibria involving chemical processes**: Law of chemical equilibrium, equilibrium constants ( $K_p$  and  $K_c$ ) and their significance, significance of  $\Delta G$  and  $\Delta G^\circ$  in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, effect of catalyst; Le Chatelier's principle.

**Ionic equilibrium**: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius, Brønsted - Lowry and Lewis) and their ionization, acid - base equilibria (including multistage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and pH of their solutions, solubility of sparingly soluble salts and solubility products, buffer solutions.

#### UNIT 8: REDOX REACTIONS AND ELECTROCHEMISTRY

Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions.

Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration: Kohlrausch's law and its applications.

Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half - cell and cell reactions, emf of a Galvanic cell and its measurement; Nernst equation and its applications; Relationship between cell potential and Gibbs' energy change; Dry cell and lead accumulator; Fuel cells.

#### UNIT 9: CHEMICAL KINETICS

Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first order reactions, their characteristics and half - lives, effect of temperature on rate of reactions - Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).

#### UNIT 10: SURFACE CHEMISTRY

**Adsorption**- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions.

Catalysis - Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism.

**Colloidal state**- distinction among true solutions, colloids and suspensions, classification of colloids - lyophilic, lyophobic; multimolecular, macromolecular and associated colloids (micelles), preparation and properties of colloids - Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation; Emulsions and their characteristics.



## SECTION - B

### INORGANIC CHEMISTRY

#### UNIT 11: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES

Modern periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

#### UNIT 12: GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF METALS

Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals - concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.

#### UNIT 13: HYDROGEN

Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water; Structure, preparation, reactions and uses of hydrogen peroxide; Classification of hydrides - ionic, covalent and interstitial; Hydrogen as a fuel.

#### UNIT 14: S-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

Group - 1 and 2 Elements

General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships.

Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.

#### UNIT 15: P-BLOCK ELEMENTS

Group - 13 to Group 18 Elements

**General Introduction:** Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group.

**Groupwise study of the p-block elements**

**Group - 13**

Preparation, properties and uses of boron and aluminium; Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminium chloride and alums.

#### Group - 14

Tendency for catenation; Structure, properties and uses of Allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.

#### Group - 15

Properties and uses of nitrogen and phosphorus; Allotropic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, ( $\text{PCl}_3$ ,  $\text{PCl}_5$ ); Structures of oxides and oxoacids of nitrogen and phosphorus.

#### Group - 16

Preparation, properties, structures and uses of ozone; Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.

#### Group - 17

Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens.

#### Group - 18

Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

#### UNIT 16: d- and f- BLOCK ELEMENTS

Transition Elements

General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties and uses of  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{KMnO}_4$ .

**Inner Transition Elements**

**Lanthanoids** - Electronic configuration, oxidation states and lanthanoid contraction.

**Actinoids** - Electronic configuration and oxidation states.

#### UNIT 17: CO-ORDINATION COMPOUNDS

Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems).

## UNIT 18: ENVIRONMENTAL CHEMISTRY

**Environmental pollution** - Atmospheric, water and soil.

**Atmospheric pollution** - Tropospheric and Stratospheric

**Tropospheric pollutants - Gaseous pollutants:** Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Green house effect and Global warming; Acid rain;

**Particulate pollutants:** Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention.

**Stratospheric pollution-** Formation and breakdown of ozone, depletion of ozone layer - its mechanism and effects.

**Water Pollution** - Major pollutants such as, pathogens, organic wastes and chemical pollutants; their harmful effects and prevention.

**Soil pollution** - Major pollutants such as: Pesticides (insecticides, herbicides and fungicides), their harmful effects and prevention.

Strategies to control environmental pollution.

### SECTION-C ORGANIC CHEMISTRY

## UNIT 19: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS

**Purification** - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.

**Qualitative analysis** - Detection of nitrogen, sulphur, phosphorus and halogens.

**Quantitative analysis** (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus.

Calculations of empirical formulae and molecular formulae; Numerical problems in organic quantitative analysis.

## UNIT 20: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

Tetravalency of carbon; Shapes of simple molecules - hybridization (s and p); Classification of organic compounds based on functional groups; and those containing halogens, oxygen, nitrogen and sulphur; Homologous series; Isomerism - structural and stereoisomerism.

**Nomenclature** (Trivial and IUPAC)

Covalent bond fission - Homolytic and heterolytic; free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles.

## Electronic displacement in a covalent bond

- Inductive effect, electromeric effect, resonance and hyperconjugation.

**Common types of organic reactions-** Substitution, addition, elimination and rearrangement.

## UNIT 21: HYDROCARBONS

Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.

**Alkanes** - Conformations: Sawhorse and Newman projections (of ethane); Mechanism of halogenation of alkanes.

**Alkenes** - Geometrical isomerism; Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoff's and peroxide effect); Ozonolysis and polymerization.

**Alkynes** - Acidic character; Addition of hydrogen, halogens, water and hydrogen halides; Polymerization.

**Aromatic hydrocarbons** - Nomenclature, benzene - structure and aromaticity; Mechanism of electrophilic substitution: halogenation, nitration, Friedel - Craft's alkylation and acylation, directive influence of functional group in mono-substituted benzene.

## UNIT 22: ORGANIC COMPOUNDS CONTAINING HALOGENS

General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution reactions.

Uses; Environmental effects of chloroform, iodoform freons and DDT.

## UNIT 23: ORGANIC COMPOUNDS CONTAINING OXYGEN

General methods of preparation, properties, reactions and uses.

### ALCOHOLS, PHENOLS AND ETHERS

**Alcohols:** Identification of primary, secondary and tertiary alcohols; mechanism of dehydration.

**Phenols:** Acidic nature, electrophilic substitution reactions: halogenation, nitration and sulphonation, Reimer - Tiemann reaction.

**Ethers:** Structure.

**Aldehyde and Ketones:** Nature of carbonyl group; Nucleophilic addition to  $>C=O$  group, relative reactivities of aldehydes and ketones; Important reactions such as - Nucleophilic addition reactions (addition of HCN,  $NH_3$  and its derivatives), Grignard reagent; oxidation; reduction (Wolff Kishner and Clemmensen); acidity of  $\alpha$ -hydrogen, aldol condensation, Cannizzaro reaction, Haloform reaction;



Chemical tests to distinguish between aldehydes and Ketones.

### CARBOXYLIC ACIDS

Acidic strength and factors affecting it.

### UNIT 24: ORGANIC COMPOUNDS CONTAINING NITROGEN

General methods of preparation, properties, reactions and uses.

**Amines:** Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.

**Diazonium Salts:** Importance in synthetic organic chemistry.

### UNIT 25: POLYMERS

General introduction and classification of polymers, general methods of polymerization-addition and condensation, copolymerization;

Natural and synthetic rubber and vulcanization; some important polymers with emphasis on their monomers and uses - polythene, nylon, polyester and bakelite.

### UNIT 26: BIOMOLECULES

General introduction and importance of biomolecules.

**CARBOHYDRATES** - Classification: aldoses and ketoses; monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).

**PROTEINS** - Elementary Idea of  $\alpha$ -amino acids, peptide bond, polypeptides; Proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.

**VITAMINS** - Classification and functions.

**NUCLEIC ACIDS** - Chemical constitution of DNA and RNA.

Biological functions of nucleic acids.

### UNIT 27: CHEMISTRY IN EVERYDAY LIFE

**Chemicals in medicines** - Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines - their meaning and common examples.

**Chemicals in food** - Preservatives, artificial sweetening agents - common examples.

**Cleansing agents** - Soaps and detergents, cleansing action.

### UNIT 28: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

● Detection of extra elements (N, S, halogens) in organic compounds; Detection of the following

functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl and amino groups in organic compounds.

● Chemistry involved in the preparation of the following:

Inorganic compounds: Mohr's salt, potash alum.

Organic compounds: Acetanilide, p-nitroacetanilide, aniline yellow, iodoform.

● Chemistry involved in the titrimetric exercises - Acids bases and the use of indicators, oxalic-acid vs  $\text{KMnO}_4$ , Mohr's salt vs  $\text{KMnO}_4$ .

● Chemical principles involved in the qualitative salt analysis:

Cations -  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$ .

Anions -  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ . (Insoluble salts excluded).

● Chemical principles involved in the following experiments:

1. Enthalpy of solution of  $\text{CuSO}_4$
2. Enthalpy of neutralization of strong acid and strong base.
3. Preparation of lyophilic and lyophobic sols.
4. Kinetic study of reaction of iodide ion with hydrogen peroxide at room temperature.

### SYLLABUS FOR APTITUDE TEST B. ARCH/B. PLANNING

Part - I Awareness of persons, places, Buildings, Materials.) Objects, Texture related to Architecture and build-environment. Visualising three dimensional objects from two dimensional drawings. Visualising different sides of three dimensional objects. Analytical Reasoning Mental Ability (Visual, Numerical and Verbal).

Part - II Three dimensional - perception: Understanding and appreciation of scale and proportion of objects, building forms and elements, colour texture, harmony and contrast. Design and drawing of geometrical or abstract shapes and patterns in pencil. Transformation of forms both 2 D and 3 D union, subtraction, rotation, development of surfaces and volumes, Generation of Plan, elevations and 3 D views of objects. Creating two dimensional and three dimensional compositions using given shapes and forms.

Sketching of scenes and activities from memory of urban scene (public space, market, festivals, street scenes, monuments, recreational spaces etc.), landscape (river fronts, jungles, gardens, trees, plants etc.) and rural life.

Note: Candidates are advised to bring pencils, own geometry box set, erasers and colour pencils and crayons for the Aptitude Test.

# **BIOLOGY**

## **CONTENTS OF CLASS XI SYLLABUS**

### **UNIT I: Diversity in Living World**

What is living? ; Biodiversity; Need for classification; Three domains of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy – Museums, Zoos, Herbaria, Botanical gardens.

Five kingdom classification; salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.

Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms- classification up to class, characteristic features and examples).

Salient features and classification of animals-nonchordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples).

### **UNIT II: Structural Organization in Animals and Plants**

Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).

Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only)

### **UNIT III: Cell Structure and Function**

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles-structure and function; Endomembrane system-endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); Nucleus-nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzymes-types, properties, enzyme action.

B Cell division: Cell cycle, mitosis, meiosis and their significance.



## **UNIT IV: Plant Physiology**

Transport in plants: Movement of water, gases and nutrients; Cell to cell transport-Diffusion, facilitated diffusion, active transport; Plant – water relations – Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water – Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration-Opening and closing of stomata; Uptake and translocation of mineral nutrients-Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).

Mineral nutrition: Essential minerals, macro and micronutrients and their role; Deficiency symptoms; Mineral toxicity; Elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen metabolism-Nitrogen cycle, biological nitrogen fixation.

Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Site of photosynthesis take place; pigments involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and noncyclic and photophosphorylation; Chemiosmotic hypothesis; Photorespiration C<sub>3</sub> and C<sub>4</sub> pathways; Factors affecting photosynthesis.

Respiration: Exchange gases; Cellular respiration-glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

Plant growth and development: Seed germination; Phases of Plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators-auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation;

## **UNIT V: Human Physiology**

Digestion and absorption; Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Caloric value of proteins, carbohydrates and fats; Egestion; Nutritional and digestive disorders – PEM, indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans-Exchange of gases, transport of gases and regulation of respiration Respiratory volumes; Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system-Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG, Double circulation; Regulation of cardiac activity; Disorders of circulatory system-Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

Excretory products and their elimination: Modes of excretion- Ammonotelism, ureotelism, uricotelism; Human excretory system-structure and function; Urine formation, Osmoregulation; Regulation of kidney function-Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders; Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

Locomotion and Movement: Types of movement- ciliary, flagellar, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical syllabus); Joints; Disorders of muscular and skeletal system- Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

Neural control and coordination: Neuron and nerves; Nervous system in humans- central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sense organs; Elementary structure and function of eye and ear.

Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system-Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease).

*(Imp: Diseases and disorders mentioned above to be dealt in brief.)*

## **CONTENTS OF CLASS XII SYLLABUS**

### **UNIT I: Reproduction**

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

## **UNIT II: Genetics and Evolution**

Heredity and variation: Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans- Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.

Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

## **UNIT III: Biology and Human Welfare**

Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.

Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

## **UNIT IV: Biotechnology and Its Applications**

Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues- Biopiracy and patents.

## **UNIT V: Ecology and environment**

Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release.

Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warming; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.





**Syllabus for MBA/ MBA (T&HM) & MCA**

**Section-A**

**Verbal Ability:**

Vocabulary Based (Synonyms Antonyms), English Usage or Grammar, Sentence Correction, Fill in the blanks, Close Passage, Analogies or Reverse Analogies, Jumbled Paragraph, Meaning-Usage Match, Summary Questions, Verbal Reasoning, Facts/Inferences/Judgements, Reading Comprehension

**Section-B**

**Quantitative Ability:**

Geometry (Lines, angles, Triangles, Spheres, Rectangles, Cube, Cone etc.), Ratios and Proportion, Percentages, In-equations Quadratic and linear equations, Algebra, Profit & Loss Averages, Partnership (Accounts), Time-Speed-Distance, Work and time, Number system, HCF & LCM Geometric Progression, Arithmetic progression, Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode, Number Base System, BODMAS, Menstruation, Allegation & Mixtures, Work, Pipes and Cisterns, Simple Interest & Compound Interest, Set Theory, Venn diagram, Installment Payments, Clocks, Probability, Permutations Combinations, Trigonometry, Vectors, Binomial Expansion, Co-ordinate geometry, Logarithm, Calendar, Maxima & Minima Progression, Surds & Indices, Complex numbers

**Section-C**

**Data Interpretation and reasoning:**

There will be questions of data interpretation which will be mostly based of various graphs.

**Graphs**

Column graphs, Bar Graphs, Line charts, Pie Chart, Graphs representing Area, Venn diagram etc.

**Reasoning**

Critical reasoning, Visual reasoning, Assumption-Premise-Conclusion, Assertion and reasons, Statements and assumptions, Identifying valid inferences, Identifying arguments, Statements and conclusions, Cause and Effect, Identifying probably true probably false, Definitely true definitely false kind of statement, Linear arrangements, Matrix arrangements (Puzzles, Syllogisms, Functions), Family tree - identifying relationship among group of people, Symbol Based problems, Coding and decoding, Sequencing etc.

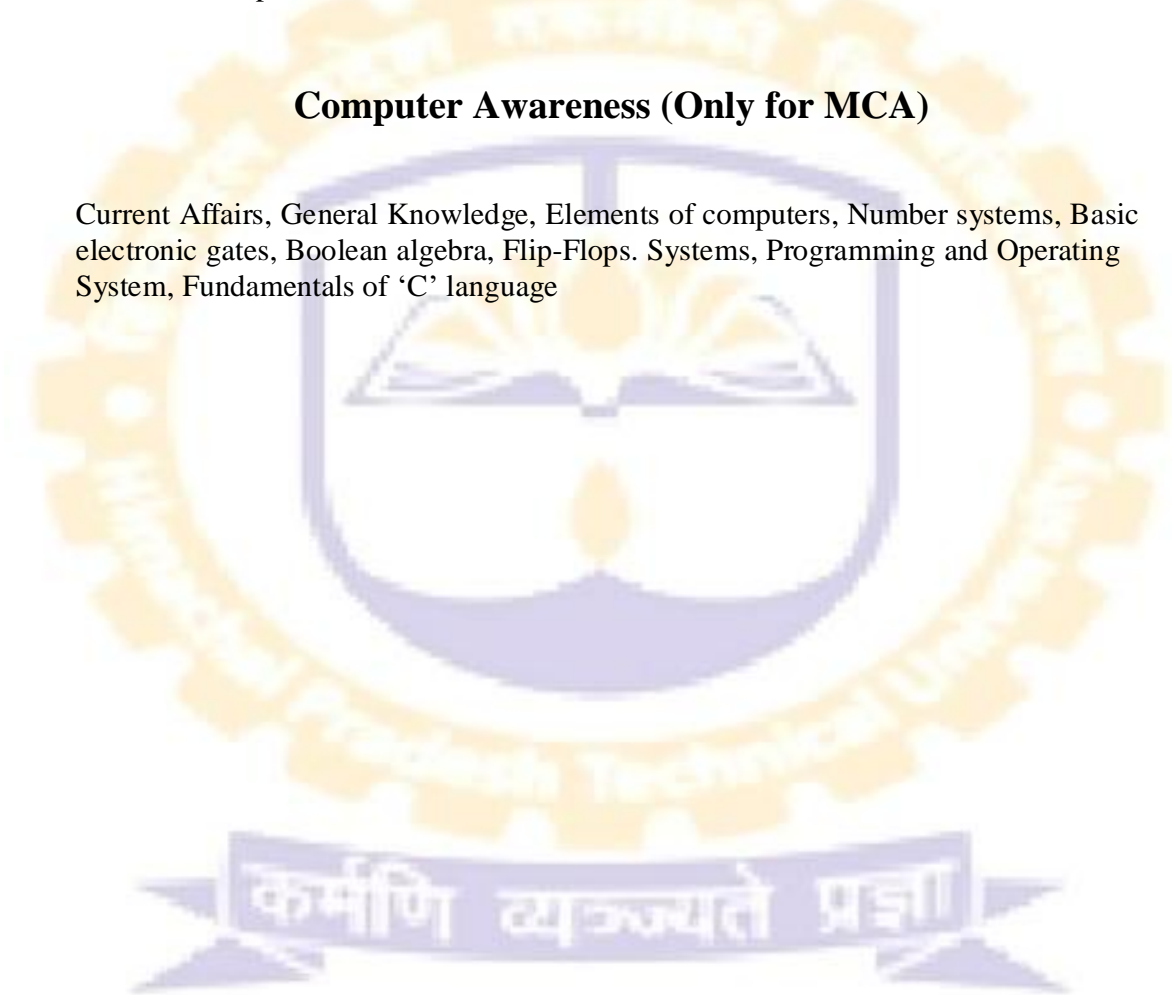
## **Section-D**

### **Business Awareness (for MBA/MBA (T&HM))**

Current Affairs, General Knowledge, Business, Punch line of companies, Top officials of big companies, Major corporate events, Famous award and prizes, World Records, Books and authors, Science, History, Geography, International organizations, Important quotations, Social issues, Sports, Finance, Automobiles, Entertainment, Politics etc.

### **Computer Awareness (Only for MCA)**

Current Affairs, General Knowledge, Elements of computers, Number systems, Basic electronic gates, Boolean algebra, Flip-Flops. Systems, Programming and Operating System, Fundamentals of 'C' language



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**Tentative Seats Available in Colleges Affiliated to Himachal Pradesh Technical University and University Off Campuses in PG Programmes for academic session 2022-23.**

		M.Tech					MBA	MCA	M. Pharma			
		Civil Engg.	Computer Science & Engg. Mechanical Engg.	Electrical Engg.	Electronics & Comm. Engg	Pharmaceutics			Pharmacognosy	Pharmacology	Pharmaceutical Analysis & Quality Assurance	
1	Green Hills Engg. College, Kumarhatti, Distt. Solan	-	-				-	-	-	-		-
2	Himalayan Institute of Engg. & Technology, Kala Amb, Distt. Sirmour-173030	-					-	-	-	-		-
3	Shiva Institute of Engg. & Technology, Bilaspur	-		-	-	-	-	-	10	10		-
4	Laureate Institute of Pharmacy, Kathog, Distt. Kangra-177101	-	-	-	-	-	-	-	15	-	15	15
5	Himachal Institute of Pharmacy, Paonta Sahib, Distt. Sirmour-173025	-	-	-	-	-	-	-	15	-		-
6	Himalayan Institute of Pharmacy, Kala-Amb, Distt. Sirmour-173030	-	-	-	-	-	-	-	15	-		-
7	L.R. Institute of Pharmacy, Village Jabli-Kyar, Oachghat, Distt. Solan-173223	-	-	-	-	-	-	-	14	10		-
8	Gautam Institute of Management & Technology, Near Bus stand Hamirpur-177001	-	-	-	-	-	120	-	-	-		-
9	Govt. Post Graduate College, Dharamshala	-	-	-	-	-	60		-	-		-
10	Govt. Post Graduate College Una,-174303	-	-	-	-	-	60		-	-		-
11	K.C. Group of Research and Professional Institute, PandogaUparla, Tehsil Haroli, District Una-177207	-	-	-	-	-	60	-	-	-		-
12	HPTU Business School, Rajiv Gandhi Govt. Engineering College at NagrotaBagwan, Distt-Kangra	-	-	-	-	-	40+ 5***	-	-	-		-
13	Himalayan Institute of Management Near Suketi Fossil Park Road, Kala Amb, Distt. Sirmour-173030	-	-	-	-	-	60	-	-	-		-
14	L.R. Institute of Management, Village Jabli-Kyar, Oachghat, Distt. Solan-173223	-	-	-	-	-	60	-	-	-		-
15	Govt. Post Graduate College Una,-174303	-	-	-	-	-	-	60	-	-		-

16	Himalayan College of Computer Science, Near Suketi Fossil Park Road, Kala Amb, Distt. Sirmour-173030	-	-	-	-	-	-	-	-	-	-
17	Govt. Post Graduate College, Dharamshala	-	-	-	-	-	-	60	-	-	-
18	L.R. Institute of Management Village Jabli-Kyar, P.O. Oachghat, Distt. Solan	-	-	-	-	-	-	60	-	-	-
<b>Seats Available in Himachal Pradesh Technical University School of Commerce and Management Hamirpur for academic session 2022-23.</b>											
Name of College		Program									
		MBA	MBA (T & HM)	MCA	M. Tech. (Computer Science)	M. Sc. Physics	M.Sc. Environment Science	BHMCT	BBA	BCA	B.Sc. (HM & CT) PG Diploma in yoga
Himachal Pradesh Technical University Campus Hamirpur		60	30	30	24	30	30	30			30
<b>Tentative Seats Available in Colleges Affiliated to Himachal Pradesh Technical University in BBA/BCA/B.Sc. HMCT Programmes for academic session 2022-23.</b>											
L.R. Institute of Hotel Management & Catering Tech. Village Jabli-Kyar, P.O. Oachghat, Distt. Solan-173223											60
Govt. College Indora, Distt. Kangra									60	60	
K. C. Institute of Hotel Mgt. Pandoga, Una											60
HPTU Business School, Nagrota Bagwan, Kangra											60

**Note: The above status of seats is on tentative basis which may increase or decrease subject to the approval of Board of Affiliation for 2022-23.**

Table 1.3 (a) Under Graduate Engineering Entry level qualification 10+2 level

Sr. No.	Major Disciplines	Mandatory courses at 10+2 Level	Other relevant course(s) for this discipline
1	Civil Engineering	Phy, Chem, Maths	NA
2	Computer Science and Engineering	Phy, Maths	For remaining single course select any courses out of 14#
3	Electrical Engineering/ Electrical & Electronics Engineering / Electronics and communication Engineering	Phy, Maths	For remaining single course select any courses out of 14#
4	Mechanical Engineering	Phy, Chem, Maths	NA
5	Architecture	As per Norms of Council of Architecture ( CoA )	

**\*\* First one or two Semesters may be so designed that students with Biology/Biotechnology background have adequate courses on Maths and Vice Versa and then the class is at level studying field for the rest of the semesters.**

**#Physics/ Mathematics / Chemistry/ Computer Science/Electronics/Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/Entrepreneurship.**



## **IMPORTANT INSTRUCTIONS**

Applicants willing to take admission in off campus of Himachal Pradesh Technical University or colleges/institutions affiliated to it are required to apply separately on the prescribed application form made available on HPTU website i.e. [www.himtu.ac.in](http://www.himtu.ac.in). The admission Brochure 2022 containing instructions for filling online application-cum-counseling form and other related information shall be made available on the website of the University by July 20<sup>th</sup>, 2022. The applicants have to attend centralized counseling to be conducted by this University as per schedule given in the admission Brochure 2022-23.

