HIMACHAL PRADESH TECHNICAL UNIVERSITY
(A STATE GOVERNMENT UNIVERSITY ENACTED BY AN ACT OF STATE LEGISLATIVE ASSEMBLY)

SUPPLEMENTARY PART

INFORMATION BROCHURE

HPCET – 2015

(FOR ADMISSION TO VARIOUS TECHNICAL & PROFESSIONAL COURSES)
The State Government vide its Notification No. EDN(TE)F(10 2/2013 dated 25 Jan 2015 has notified the eligibility criteria for admission in Technical and Professional Courses from academic session 2015-16 onwards in respect of the institutions as specified under Section 2 of the Act 2008i.eHimachal Pradesh Technical University and colleges affiliated to it, deemed to be University, or other Universities established under the State Act or Constituent units thereto.

In compliance to above referred notification Himachal Pradesh Technical University (hereinafter called as HimTU) will conduct Common Entrance Test (hereinafter called HPCET-2015). The detail procedure for admissions to these courses has been given in Information Brochure Part-I available on website of the university.

Now the university has decided to add and delete some of courses in HPCET-2015 mentioned in the Information Brochure. Detail of these courses and their eligibility criteria, procedure of admission along with syllabus is given below:-

<table>
<thead>
<tr>
<th>Name of Programme/ Course</th>
<th>Status</th>
<th>Eligibility Criteria</th>
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</thead>
<tbody>
<tr>
<td>B. Tech (Food Technology &amp; Bio Technology)</td>
<td>Added in HPCET-2015</td>
<td>Shall be same as given in Table 1 &amp; 2 of the Information Brochure HPCET-2015</td>
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<tr>
<td>M.Tech. (Biotechnology and Food Technology)</td>
<td>Added in HPCET-2015</td>
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<tr>
<td>M.Tech. (Textile Engineering and Fiber Science)</td>
<td>Deleted from HPCET-2015</td>
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**Syllabus for HPCET-2015 (Newly Added Course)**

1. B.Tech. (Biotech and Food Technology):- Syllabus for these courses will be same as given in **Appendix-A of Information Brochure Part-I**. Including Syllabus of Biology.

2. M.Tech. (Biotechnology and Food Technology):- Syllabus for HPCET-2015 M.Tech. (Biotechnology and Food Technology) as under:
Syllabus for M.Tech.

SECTION- A
(Common to all branches)

General Aptitude

(a) Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.

(b) Numerical Ability: Numerical computation, numerical estimation, numerical reasoning and data interpretation.

SECTION- B
Branch wise Syllabus for M.Tech.

M.Tech. Biotechnology

(a) Basic and Biochemical Engineering Technology:

Basic Engineering and Technology

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

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

reactors. Filtration and membrane based separations, centrifugation, extraction, absorption and chromatography.

(b) Physics, Chemistry Mathematics, and Computer and Information Sciences


Mathematics:

Calculus - Differential Equation- Complex numbers- Complex integration- Power series- Three Dimensional Geometry-Algebra, Vectors- Trigonometry- Differentiation & Integration- Matrices

Physics:


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

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

**Chemistry:**

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

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

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

(c) **Fundamentals of Life Sciences**


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

**Molecular biology & recombinant DNA technology:** Properties of nucleic acids, chromosomes, DNA replication, damage and repair, gene manipulation, cloning vectors, gene libraries, screening of libraries, gene cloning, applications of recombinant DNA technology, PCR, RFLP, Western, Northern and Southern blotting.
**Immunology:** Cells of the immune system, lymphoid tissues, complement, antibodies, hybridoma technology, applications of monoclonal antibodies, antigen recognition, processing and presentation, cell mediated immunity, cytokines, hypersensitivity, vaccine technology, autoimmunity, transplantation, immune responses to various infections, Immunotechnology.

**Bioremediation and Environmental Biotechnology**


**Animal and Plant Biotechnology:** Advantages, Limitations, and Application of animal cell cultures, techniques of animal cell culturing, media and preservation of animal cell cultures, stem cells and their applications, Transgenic Animals and their applications, Gene Therapy, In Vitro Fertilization and Embryo Transfer. General Techniques of plant tissue culture, plant cell culture media, micro propagation, callusing, and Somatic Embryogenesis, factors affecting somatic embryogenesis, Haploid, diploid and triploid Production, production of pathogen free plants, Germplasm Storage, Transgenic plants and their applications.

**Enzyme Technology:** Enzymes and their properties, nomenclature and classification of enzymes; Mechanism of enzyme catalysis, kinetics of enzyme-catalyzed reaction, inhibition of enzyme activity, metalloenzyme, coenzymes, allosteric enzymes and their regulation, Concept, methods and used of enzyme immobilization, production of industrial uses of enzymes, diagnostic and therapeutic application of enzymes, Enzymes in molecular biology; Enzyme Engineering, enzymes from extremophiles, Abzymes, ribozymes.
**Bioinstrumentation:** Techniques and principle of gel electrophoresis, SDS-PAGE, isoelectric focusing, two-dimensional electrophoresis, immuno-electrophoresis, capillary electrophoresis, TLC, Gel filtration, Ion-exchange chromatography, affinity-chromatography, HPLC & GLC, UV & Visible spectroscopy, Infrared & atomic absorption spectroscopy, fluorescence spectroscopy, Mass spectrometry, MALDI-TOF, Nuclear Magnetic resonance & Electron spin resonance spectrometry, X-ray diffraction & X-ray crystallography.

**Cell Biology:** Basic unit of living systems, Cell theory and dynamics, cell structure of bacteria, plant and animals, different cell membrane models, solute transport across membranes, membrane transporters and trans-membrane proteins, cytoskeleton & cell surface, Cell Cycle, cell division & its Regulation, Phases of cell cycle, cell cycle check points, inhibitors of cell cycle check points and factors involved in cell cycle regulation, cell-cell interactions & cell matrix interactions, cell differentiation, cell locomotion (amoeboid, flagellar, &ciliar), hormones & growth factors, Cell senescence, Apoptosis & necrosis, Signal transduction through receptor interacting with G-protein/receptor with tyrosine kinase activity, Non-receptor mediated signaling, steroid receptors, role of second messengers like c-AMP, Inositol-tri-phosphate, Diacylglycerol, Ca^{2+} ions, mechanisms. Cell differentiation in plants and animals: totipotent, multipotent and pleuripotent cell.

**Microbiology:** History of Microbiology, Germ theory, Disciplines of Microbiology, Structure of Microbes (bacteria, archaea, algae, fungi and viruses), Microbial taxonomy including modern approaches of taxonomy such as DNA taxonomy and Numerical taxonomy, different groups of bacteria, Principles of microbial nutrition, culture media, theory and practice of sterilization, pure culture techniques, Microbial growth: synchronous and asynchronous, pure culture, growth inhibitory substances, Photosynthesis in microorganisms, Transformation, transduction, conjugation and mutations, Important microbial pathogens, toxins, mode of action of toxins, Microbial ecology (with reference to C and N cycle).

**M. Tech. (Food Technology)**

**Food Microbiology:** Intrinsic and extrinsic properties of food and their role in relation to microbial growth. Microbiology of fruit and vegetable products, soft drinks, bakery products, milk and milk products, milk, fish, egg and marine produces. Spoilage of foods, food pathogens and their toxins in relation to human health. Food preservation by sugar, salt, chemicals, heat, cold, irradiation, dehydration and packaging. Microbiology of fermented foods and beverages and factors affecting their quality. Methods for microbiological examination of foods, food hygiene and safety regulations. Water quality and waste disposal in food industry.

**Food Chemistry and Nutrition:** Chemistry of food constituents, physical properties of foods, properties of colloidal systems, gels and emulsions. Minerals in foods, physicochemical changes in foods during processing and storage, functions of food nutrients, dietary allowances and nutritional requirements. Metabolism of carbohydrates, lipids and protein. Biological value and PER. Food additives, contaminants and anti-nutritional factors. National and international standards, application of spectroscope, electrophoresis and chromatography in food analysis.

**Food Engineering:** Engineering properties of food materials, System analysis, mass and energy balance, Principles operations and equipment for food materials flow handling, cleaning dehusking sorting and grading peeling, size reduction, mixing and forming, bakery foods manufacture, extrusion, separation, filtration and membrane processes, expression, baking roasting, frying, extraction and leaching, crystallization, distillation, blanching, pasteurization, sterilisation, evaporation, drying, freezing, packing, heat exchanging, dairy specific operations. Process equipment design, heat and mass transfer, equipment for steam generation, compressed air, refrigeration and air conditioning, water and waste water treatment, Food plant layout and design.

**Food Products Technology:** Preparation and manufacturing technology of cereals and bakery products, beef, poultry, egg, fish, sausages and table ready meats, dairy products, fresh fruits, fresh vegetables, processed fruits and vegetables, fats and oils, fermented foods, alcoholic and non-alcoholic beverages. Dehydration and concentration methods, irradiation, microwave processing of foods, food by-products & downstream processing. Judging of food products, Food Laws and regulations. Effluent treatment and environment pollution, food storage, functions of packaging,
packaging operations, types of containers, hermetic closures, canning packaging materials and package testing, transportation and marketing of food products.

**SECTION- C**
*(Common to all branches)*

*Engineering Mathematics*


**Calculus:** Functions of single variable, limit, continuity and differentiability, Mean value theorems, Indeterminate forms and L'Hospital rule, Maxima and minima, Taylor’s series, Fundamental and mean value theorems of integral calculus. Evaluation of definite and improper integrals, Beta and Gamma functions, Functions of two variables, limit, continuity, partial derivatives, Euler’s theorem for homogeneous functions, total derivatives, maxima and minima, Lagrange method of multipliers, double and triple integrals and their applications, sequence and series, tests for convergence, power series, Fourier Series, Half range sine and cosine series.

**Complex variable:** Analytic functions, Cauchy-Riemann equations, Application in solving potential problems, Line integral, Cauchy’s integral theorem and integral formula (without proof), Taylor’s and Laurent’ series, Residue theorem (without proof) and its applications.

**Vector Calculus:** Gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, Stokes, Gauss and Green’s theorems (without proofs) applications.

**Ordinary Differential Equations:** First order equation (linear and nonlinear), Second order linear differential equations with variable coefficients, Variation of parameters method, higher order linear differential equations with constant coefficients, Cauchy- Euler’s equations, power series solutions, Legendre polynomials and Bessel’s functions of the first kind and their properties.

**Partial Differential Equations:** Separation of variables method, Laplace equation, solutions of one dimensional heat and wave equations.

**Probability and Statistics:** Definitions of probability and simple theorems, conditional probability, Bayes Theorem, random variables, discrete and continuous distributions, Binomial, Poisson, and normal distributions, correlation and linear regression.
**Numerical Methods:** Solution of a system of linear equations by L-U decomposition, Gauss-Jordan and Gauss-Seidel Methods, Newton’s interpolation formulae, Solution of a polynomial and a transcendental equation by Newton-Raphson method, numerical integration by trapezoidal rule, Simpson’s rule and Gaussian quadrature, numerical solutions of first order differential equation by Euler’s method and 4th order Runge-Kutta method.