PEOPLE'S UNIVERSITY

People's College of Dental Sciences and Research Center

Name of Program- BDS

Program Outcomes

At the end of the program, the dental Graduate shall have the following attributes:

PO1- Knowledge and understanding

PO2- Skills

PO3- Attitudes.

PO1- KNOWLEDGE AND UNDERSTANDING

The graduate should have:

Key Elements-

1. Adequate knowledge of the scientific foundations on which dentistry is based and good understanding of various relevant scientific methods, principles of biological functions and be able to evaluate and analyze scientifically various established facts and data.

2. Adequate knowledge of the development, structure and function of the teeth, mouth and jaws and associated tissues both in health and disease and their relationship and effect on general state of health and also bearing on physical and social well being of the patient.

3. Adequate knowledge of clinical disciplines and methods which provide a coherent picture of anomalies, lesions and diseases of the teeth, mouth and jaws and preventive diagnostic and therapeutic aspects of dentistry.

4. Adequate clinical experience required for general dental practice.

5. Adequate knowledge of the constitution, biological function and behavior of persons in health and sickness as well as the influence of the natural and social environment on the state of health in so far as it affect dentistry.

PO2- SKILLS

A graduate should be able to demonstrate the following skills:

Key Elements-

1. Able to diagnose and manage various common dental problems encountered in general dental practice keeping in mind the expectations and the right of the society to receive the best possible treatment available wherever possible.

2. Acquire the skill to prevent and manage complications if encountered while carrying out various surgical and other procedures.

3. Possess skill to carry out certain investigative procedures and ability to interpret laboratory findings.

4. Promote oral health and help prevent oral diseases where possible.

5. Competent in the control of pain and anxiety among the patients during dental treatment.

PO3: ATTITUDES

A graduate should develop following attitudes:

Key Elements-

1. Willing to apply the current knowledge of dentistry in the best interest of the patients and the community.

2. Maintain a high standard of professional ethics and conduct and apply these in all aspects of professional life.

3. Seek to improve awareness and provide possible solutions for oral health problems and needs throughout the community.

4. Willingness to participate in the CPED Programmes to update the knowledge and professional skill from time to time.

5. To help and participate in the implementation of the national oral health policy.

For Mapping

3- Fully Met (For a particular CO, if there are ≥4 Key elements in a particular PO met)

2-Partially Met (For a particular CO, if there are ≥2 Key elements <4 Key Elements in a particular PO met)

1-Poorly Met (For a particular CO, if there is 1 key element in a particular PO met)

NA-Not Applicable

COURSE OUTCOMES

Physiology and Biochemistry BD -102

Course Name	Course Outcome	Statement
Physiology and Biochemistry	BD -102.1	The student should understand the unique role of each organ and organ system in maintaining the health
	BD - 102.2	The student should learn to identify the bodily process, which enable them to recognize impairment thereof.
	BD-102.3	Structure and composition of human blood and its metabolism. Regulation and functions of essential organ like liver, kidney and blood sugar level and its regulation
	BD-102.4	Nomenclature, classification and basic structure of essential nutrients and their metabolism and interaction with human body. Energy needs nutritional balance and malnutrition including energy and mineral metabolism. Read and interpret biochemical report and relate them clinically.
	BD-102.5	Structure and composition of human blood and its metabolism. Regulation and functions of essential organ like liver, kidney and blood sugar level and its regulation

PO-CO Mapping

Year	Course name	PO → / CO ↓	PO1	PO2	PO3
I Year	Physiology & Biochemistry	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Dental Anatomy, Histology Embryology and Oral Physiology –Bd-103

At the end of course, the student would be able to:

1. Identification of deciduous & permanent teeth and carving of permanent teeth in wax
2. Detailed microscopic study and applied aspects (clinical and forensic significance and histological considerations) of oral and paraoral tissues
3. The student is expected to appreciate the normal anatomy, morphology, physiology & functions of oral tissues & variations in different physiologic /non-pathological conditions
4. The student should understand physiologic ageing process in the dental hard and soft tissues and age estimation by patterns of teeth eruption from plaster casts of different age groups
5. Development, growth and age changes oral and paraoral tissues with applied aspects

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
I Year	**DENTAL ANATOMY, HISTOLOGY EMBRYOLOGY AND ORAL PHYSIOLOGY**	CO1	3	2	2
		CO2	3	2	2
		CO3	3	2	2
		CO4	3	2	2
		CO5	3	2	2
Average		CO	3	2	2

General And Dental Pharmacology & Therapeutics –Bd-202

At the end of course, the student would be able to:

- Describe the Pharmacodynamics, pharmacokinetics of essential & commonly used drugs in general and particularly in dentistry.
- Tailor use the appropriate drugs in disease with consideration to its cost, efficacy, safety for individual and mass therapy needs.
- List the indications, contraindications, interactions and adverse reactions of commonly used drugs with reason.
- Describe pathogenesis and etiology of oral disease as well as systemic disease having oral manifestations.
- Integrate the rational drug therapy in clinical Pharmacology.

PO-CO Mapping

Year	Course name	PO → / CO ↓	PO1	PO2	PO3
II Year	General and Dental Pharmacology & Therapeutics	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Dental Materials (Course Code: BD- 203)

YEAR	COURSE NAME	CO	STATEMENT
II Year	Dental materials	CO.1	The student has knowledge about the use and properties of all dental materials.
		CO.2	The student shall choose, manipulate and use appropriate dental materials in a given clinical scenario and laboratory procedures.
		CO.3	The student is now prepared to adopt new methods and advances in dental material science.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
II Year	Dental material	CO1	3	3	3
		CO2	3	2	3
		CO3	3	3	2
Average		CO	3	2.66	2.66

Pre- Clinical Prosthodontics (Course Code: Bd- 204)

YEAR	COURSE NAME	CO	STATEMENT
II Year	Pre- Clinical Prosthodontics	CO.1	The student has acquired knowledge pertaining to diagnosis and treatment planning for patients requiring complete denture treatment.
		CO.2	The student has acquired skills to carry out various laboratory procedures to fabricate complete dentures and removable partial dentures.
		CO.3	Properties and use of various materials used in fabricating complete and removable partial dentures.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
II Year	Pre-Clinical Prosthodontics	CO1	3	2	2
		CO2	3	3	2
		CO3	3	3	2
Average		CO	3	2.66	2

General Medicine –BD 301

CO	COURSE OUTCOME DESCRIPTION
CO1	Has basic knowledge of diseases and medicines and be able to take general case history of the medical cases
CO2	Has basic knowledge about general investigations like blood pressure recording ,inspection,palpation of medical cases.
CO3	Has basic knowledge about the dental management of medically compromised cases.
CO4	Ability to apply current knowledge of general medicine in the best interest of patients and community.

Co-Po Mapping:

Year	Course name	PO → CO ↓	PO1	PO2	PO3
III Year	General Medicine	CO1	3	3	3
		CO2	3	3	3
		CO3	2	2	3
		CO4	3	3	3
Average		CO	2.75	2.75	3

Course Outcomes General Surgery – BD 302

- Basic knowledge of surgical treatment of diseases of head , neck and face .
- Basic knowledge of treatment of surgical emergencies .
- Knowledge of dental surgery in diabetic , hypertensive patients .
- Knowledge of investigations and management of medical disease in patients of dental surgery .

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
III Year	General surgery	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
Average		CO	3	3	3

Oral Pathology& Microbiology –Bd-303

At the end of course, the student would be able to:

- Acquire the competence pertaining to Oral pathology and disease of oral cavity that is required to be practiced in the community and record clinical presentation with histopathological features and enumerate list of diagnostic methods and various treatment modalities
- Describe pathogenesis and etiology of oral disease as well as systemic disease having oral manifestations. And acquire the skills to handle soft and hard tissue specimens and teeth casts.
- Effectively communicate with patient,
- Define, classify and describe various aspects of forensic odontology and its applied aspects.and Know about the latest developments in the field of oral pathology.
- Acquire knowledge and skill about identification of human and its age, medico legal record keeping and presentation.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
III Year	Oral Pathology & Microbiology	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Oral Medicine & Radiology –BD-401

At the end of course, the student would be able to:

- The student can identify precancerous and cancerous lesions of oral cavity and knows about its medical and surgical management record clinical presentation with histopathological features and enumerate list of diagnostic methods and various treatment modalities.
- The student educates patient with common dental problems like dental caries, periodontal disease and their squeal.
- The student knows about oral manifestation of systemic disease and about the medical complications that can arise while treating systemically compromised patients and takes prior precaution/consent from the concerned medical specialist, effectively communicate with patient,
- The student can record a detailed case history and perform clinical examination of patients to arrive at a provisional diagnosis and formulates the order of investigation to seek expert consultation. Know about the latest developments in the field of oral pathology.
- The student is able to handle patients with great compassion, explain them the required treatment options and also to educate about the preventive aspects of oral diseases and orofacial pain.
- The student should learn about the basics of radiation physics and knows about the radiation hazards, radiation safety and protection
- Student knows about the intraoral and extraoral techniques, interpretations and extraoral radiographic techniques and knows about their application in oral lesions and trauma management.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
III Year	Oral Medicine & Radiology	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
		CO6	3	3	3
		CO7	3	3	3
		CO8	3	3	3
Average		CO	3	3	3

Public Health Dentistry BD– 402

CO	COURSE OUTCOME DESCRIPTION
CO1	Understand and analyse various health problems related to dentistry and medicine based on planning, implementation, administration and evaluation technique
CO2	Design and analyse community health programs
CO3	Understand and adopt ethical practices during conduction of researches
CO4	Ability to conduct health survey in order to analyse for the effective utilization of manpower, met and unmet needs

CO-PO MATRIX:

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Public Health Dentistry	CO1	3	3	3
		CO2	3	3	3
		CO3	2	2	3
		CO4	3	3	3
Average		CO	2.75	2.75	3

Orthodontics And Dentofacial Orthopaedics BD 403

CO1. Be able to understand about normal growth and development of facial skeleton and dentition.

CO2. Be able to pinpoint aberrations in growth process both dental and skeletal and plan necessary treatment. Be able to diagnose the various malocclusion categories.

CO3. Be able to motivate and explain to the patient (and parent) about the necessity of treatment and plan and execute preventive orthodontics (space maintainers or space regainers). Execute interceptive orthodontics (habit breaking appliances).

CO4. Be able to manage treatment of simple malocclusions such as anterior spacing using removable appliances and to handle delivery and activation of removable orthodontic appliances.

CO5. Be able to diagnose and appropriately refer patients with complex malocclusion to the specialist. Be able to appreciate the role of dentofacial growth in the development and treatment of malocclusion.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Orthodontics and DentofacialOrthopaedics	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Periodontology –BD-402

At the end of course, the student would be able to:

Year	Course Name	CO	Statement
Final Year BDS	Periodontology	BD402.1	The student now knows the normal anatomy of Oral mucosa, Gingiva and supporting structures of the teeth & differentiation between the normal and diseased structures of periodontium.
		BD402.2	The student knows the periodontal conditions that could be manifestations of systemic conditions in the body and knowledge to refer patients to Specialists and Physicians whenever needed.
		BD402.3	The student can now formulate statistical analysis of the common and rare conditions occurring in the given populations.
		BD402.4	The student now diagnoses periodontal conditions based on risk factors and formulate treatment plan to eliminate those risk factors.
		BD402.5	The student can identify social, economic, environmental and emotional determinants in periodontal health and disease conditions and take them into account for planned treatment. The student can now undertake preventive programs in the community.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Periodontology	BD402.1	3	3	3
		BD402.2	3	3	3
		BD402.3	3	3	3
		BD402.4	3	3	3
		BD402.5	3	3	3
Average		BD402	3	3	3

Prosthodontics -BD-405

At the end of course, the student would be able to:

CO 1 The student has knowledge about dental materials their uses and clinical applications in various field of dentistry. The students also acquire the skills to handle the materials.

CO 2 The student is now able to use dental material without harming the patient and use the material without wastage, the student knows about Personal hygiene, infection control, prevention of cross infection, and also Know about the recent advances in field of dental materials.

CO3 The student knows about Ethics, laws and Jurisprudence and forensic odontology in Prosthodontics. The student now has Professional honesty, integrity & effective communication with patients.

CO 4 The student is now willing to share the knowledge and clinical experience with professionals and adopt new methods, recent advances, techniques in prosthodontics which based on scientific research which is in the patient's best interest.

CO 5 The student can diagnose and plan proper treatment for patients requiring simple Prosthodontic therapy, the student can read and interpret a radiograph and other investigations for the purpose of diagnosis and treatment plan. The student can also diagnose failed restorations and provide Prosthodontic therapy and after care, and refer complex cases to specialist.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Prosthodontics	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	2	2
Average		CO	3	2.8	2.8

Conservative Dentistry And Endodontics –BD-406

At the end of course, the student would be able to:

CO- 1 Acquire adequate knowledge, necessary skill and attitude to carry out dental practice involving prevention, diagnosis and treatment of anomalies and diseases of teeth and associated hard and soft tissues

CO- 2 Define and Classify disease of teeth and adjacent tissues and plan out the treatment preferences

CO- 3 Understand and demonstrate the etiology, patho-physiology and clinical manifestation of diseases of the teeth and adjacent hard and soft tissues.

CO- 4 Acquire basic knowledge of etiology, biology, prevention, interception and management of carious and non carious lesion of teeth. Choose various methods to identify the disease process at different stages and determine the treatment modalities.

CO- 5 Demonstrate basic knowledge of the biological basis of endodontics and management of various endodontic situations including diagnosis, treatment planning and treatment modalities.Understand and able to perform Root Canal Therapy in the Anterior Teeth.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
III Year	Conservative Dentistry &Endodontics	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Oral & Maxillofacial Surgery –BD-407

At the end of course, the student would be able to:

CO 1 Acquire the competence pertaining to local anesthesia and exodontia

CO 2 Record clinical presentation, diagnostic methods and various treatment modalities for various cases requiring surgical intervention in maxillofacial region.

CO 3 Knowledge onpathogenesis and etiology of oral disease as well as systemic disease having oral manifestations.

CO 4 Acquire the skills to various oral surgical procedures including pre-prosthetic procedures, alveoloplasty, surgical extraction of impacted teeth, dentoalveolar infections and Apicectomy. Acquire knowledge and skill in managing basic maxillofacial trauma.

CO 5 Effectively communicate with patient and maintain high professional ethics.Through knowledge on advanced oral and maxillofacial surgical interventions and protocols to refer complex cases to a specialist. Knowledge about the latest developments and advances in the field of oral & maxillofacial surgery.

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Oral & Maxillofacial Surgery	CO1	3	3	3
		CO2	3	3	3
		CO3	3	3	3
		CO4	3	3	3
		CO5	3	3	3
Average		CO	3	3	3

Pediatric & Preventive Dentistry– BD-408

At the end of course, the student would be able to:

General skills and Communication

Able to instill a positive attitude and behavior in children towards oral health and understand the principles of prevention and preventive dentistry right from birth to adolescence.

Able to guide and counsel the guardian/ parents with regard to various treatment.

According to Bloom's Taxonomy –Understand and Apply

Practice Management

Have knowledge of the organization and community and apply the principles of health promotion and disease prevention.

According to Bloom's Taxonomy – Knowledge and Apply

Patient care – Diagnosis and Treatment

Able to diagnose and treat dental diseases occurring in the child patient. Plan and execute caries control, surgical intervention, preventive orthodontics and interceptive orthodontics.

According to Bloom's Taxonomy –Evaluate, Analyse and Apply

Patient care – Special Children

Able to manage physically and mentally challenged/ disabled and medically compromised children, effectively and efficiently, tailored to the needs of individual requirement and conditions.

According to Bloom's Taxonomy – Understand, Apply, Analyse and Create

PO-CO Mapping

Year	Course name	PO → CO ↓	PO1	PO2	PO3
IV Year	Pediatric & Preventive Dentistry	CO1	3	3	3
		CO2	2	2	2
		CO3	3	3	3
		CO4	3	3	3
Average		CO	2.75	2.75	2.75

COURSE OUTCOMES OF BMLT

BMLT – I YEAR

S. NO	COURSE CODE	COURSE	COURSE OUTCOMES
1	BMLT-101	BIOCHEMISTRY	1. The students shall able to build up theoretical knowledge of Biochemistry to future endeavours. 2. The students shall able to demonstrate all the instruments & glassware's which are performed in routine medical/technical laboratory.
2.	BMLT- 102	HEMATOLOGY & CLINICAL PATHOLOGY	1. The students shall able to build up theoretical knowledge of Hematology & Clinical pathology to future prospects. 2. The students shall able to know about all the basic techniques/ procedures & manual methods which are performed in routine medical/technical laboratory.
3.	BMLT -103	APPLIED HISTOLOGY	1. The students shall able to build up theoretical knowledge of applied histology along with Anatomy & Physiology of various systems of the body to future prospects. 2. The students shall able to know the basic techniques of histology & cytology which are performed in routine medical/technical laboratory.

4.	BMLT- 104	MICROBIOLOGY	1. The students shall able to build up theoretical knowledge of Microbiology to future prospects. 2. The students shall able to know the basic techniques involved in microbiology which are performed in routine medical/technical laboratory.

BMLT – II YEAR

S. NO	COURSE CODE	COURSE	COURSE OUTCOMES
1	BMLT-201	ANALYTICAL BIOCHEMISTRY	1. The students shall able to build up theoretical knowledge of Analytical Biochemistry to future endeavours. 2. The students shall able to demonstrate all the instruments which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.
2.	BMLT- 202	HEMATOLOGY	1. The students shall able to build up theoretical knowledge of Hematology to future prospects. 2. The students shall able to know about blood banks & blood coagulation procedures which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the

			confidence, communicate & convey the patient various administrative and/ or home programs, etc.
3.	BMLT -203	CELLULAR PATHOLOGY	1. The students shall able to build up theoretical knowledge of Cellular Pathology to future prospects. 2. The students shall able to demonstrate all the histological study of various systems of the body, instrumentation & cytological techniques /procedures which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.
4.	BMLT- 204	IDENTIFICATION OF BACTERIA	1. The students shall able to build up theoretical knowledge of Identification of bacteria to future prospects. 2. The students shall able to aware of techniques involved in identification & isolation of various microorganisms which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.

BMLT – III YEAR

S. NO	COURSE CODE	COURSE	COURSE OUTCOMES
1	BMLT-301	CLINICAL BIOCHEMISTRY	1. The students shall able to build up theoretical knowledge of Clinical Biochemistry to future endeavours. 2. The students shall able to demonstrate all the biochemical tests/procedures which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.
2.	BMLT- 302	APPLIED HEMATOLOGY	1. The students shall able to build up theoretical knowledge of Applied Hematology to future prospects. 2. The students shall able to demonstrate all the hematological tests/procedures which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.
3.	BMLT -303	SPECIAL HISTOLOGY	1. The students shall able to build up theoretical knowledge of special Histology to future prospects. 2. The students shall able to demonstrate all the histological tests/procedures which are performed in routine medical/technical laboratory.

			3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.
4.	BMLT- 304	APPLIED MICROBIOLOGY	1. The students shall able to build up theoretical knowledge of Applied Microbiology to future prospects. 2. The students shall able to demonstrate all the microbiological tests/procedures which are performed in routine medical/technical laboratory. 3. The students shall able to demonstrate their attitude required to counsel, develop the confidence, communicate & convey the patient various administrative and/ or home programs, etc.

PEOPLE'S UNIVERSITY

PROGRAM OUTCOMES FOR BACHELOR OF PHYSIOTHERAPY

(BPT)

The 4½ years program of Bachelor of Physiotherapy is intended to provide comprehensive knowledge, individually focused clinical training & vertical exposure to a real life experience of a successful physiotherapist. At the end of the programme the student shall able to built up / perform the following:

S.NO	PROGRAM OUTCOMES
PO1	The student shall acquire the Knowledge related to Basic Medical Sciences and able to apply in context with clinical applications.
PO2	The student shall able to exercise physiotherapeutic knowledge for critical thinking, judgment and life- long learning skills.
PO3	The student shall be capable of individually applying evaluation and management interventions for various physiotherapy subjects.
PO4	The student shall able to demonstrate the continued updation on clinical skills via experience, journal reviews, workshops etc.
PO5	The Student shall demonstrate Health Ethics and Professional Code of Conduct, better communication skills, leadership quality, team work, and social responsibilities.

PEOPLE'S UNIVERSITY

PEOPLE'S INSTITUE OF HOTEL MANAGEMENT, CATERING TECHNOLOGY & APPLIED NUTRITION, BHOPAL

NAME OF PROGRAMME: BHMCT/BBA(HHA)

PROGRAM OUTCOMES

PO1	Hospitality Management Knowledge	Apply the knowledge of Hospitality Management, Culinary Science, Human Resource Management, Communication Skills and Marketing to the solution of Hospitality and Tourism World.
PO2	Problem Analysis	Identification of problems of Hospitality Industry, Formulation, Research Literature, and analyze complex Hospitality Management problems reaching substantiated conclusions using Principles of Hospitality
PO3	Project Development and Solutions	Develop and study the project case related to Hospitality Industry and Designing and Developing Solutions.
PO4	Modern Management Methods	Create and integrate new solutions and adopt new methods of Culinary Science and Management Practices with an understanding of the limitations.
PO5	The Hospitality Professionals and Society	Creation and Application of Hospitality Knowledge to serve the society.
PO6	Environment and Sustainability	Understand the impact of the Hospitality Education and Culinary Science on society and environments for Sustainable Development.
PO7	Ethics	Apply the ethical principles and commit to professional ethics and responsibilities and norms of the Hospitality Management Practices. •Respect of Tourists/Guests and Colleagues that encompasses without prejudice diversity of the background, language in culture.

		• An understanding of Tourist's/Guest's right particularly with regard to confidentiality.
PO8	Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams, and in Multidisciplinary Hospitality Settings.
PO9	Communication	Communicate effectively with teams, leaders as well as societies such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give &receive clear instructions.
PO10	Management & Culinary Skills	Develop management skills and learn culinary skills for a successful career as a Hospitality Management Professional.
PO11	Critical Thinking	Develop critical thinking skills and apply them to complex problems.
PO12	Social Interaction	Demonstrate the attitude favorable to the field of Hospitality Tourism and elicit views of others, mediate disagreements and help to reach conclusions in large Hospitality Group Settings
PO13	Effective Citizenship	Develop to work as team with empathy and sensitivity towards others, the ability to act with an informed awareness of issues and participate in civic life through volunteering contexts.
PO14	Self-Directed and Learning	Acquire the ability to engage in independent and life-long learning in the broadest context of socio-cultural changes of Hospitality Industry.

NAME OF COURSE: FOOD PRODUCTION-I (Basic Culinary Skills-Indian Cuisine)

Paper Code	Subject	Corse Outcomes
BH-101	Food Production-1 (Basic Culinary Skills-Indian Cuisine)	CO-1 : Express the concept of food production
		CO-2 : Relate the concepts taught with industry requirements
		CO-3 : Demonstrate the professional skills learnt
		CO-4 : Develop culinary skills for employability & entrepreneurship

PEOPLE'S COLLEGE OF HOTEL MANAGEMENT,CATERING TECHNOLOGY& APPLIED NUTRITION BHANPUR, BHOPAL

FOOD PRODUCTION-I (Basic Culinary Skills-Indian Cusine)

BBA(HHA)- FIRST SEMESTER (2019-20 BATCH) JAN-2020

Initial Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	1	2	3	2	1	1	2	3	3	1	2	1	1
CO2	3	3	3	3	3	2	1	2	1	3	3	2	3	3
CO3	3	3	3	2	2	2	1	1	3	1	2	1	2	1
CO4	3	3	3	2	3	3	2	3	3	3	2	3	2	3
Weight Avarage	3	2.5	2.8	2.5	2.5	2	1.3	2	2.5	2.5	2	2	2	2

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
FOOD PRODUCTION-I														
WA	3	2.5	2.8	2.5	2.5	2	1.3	2	2.5	2.5	2	2	2	2

NAME OF COURSE: Quantity Culinary Arts (Indian Cuisine)

Paper Code	Subject	Corse Outcomes
BH-301	Quantity Culinary Arts (Indian Cuisine)	CO-1: Understand the different types of alcoholic beverages and different types of wines as well as the procedure for production. (Including beer and other fermented beverages like Aperitifs liqueurs and digestives)
		CO-2 : Apply the knowledge of different alcoholic beverages and classify them along with processing of each wines of different Countries and develop wine tasting skills for employability & entrepreneurship
		CO-3 : Analyze the harmonious matching of Food & Wine along with the various glassware and their capacities
		CO-4: Understand and implement in personal and professional life, responsible behavior regarding handling and consumption of alcoholic beverages in social and professional settings.

PEOPLE'S COLLEGE OF HOTEL MANAGEMENT,CATERING TECHNOLOGY& APPLIED NUTRITION BHANPUR, BHOPAL

Quantity Culinary Arts (Indian Cuisine)

BBA(HHA)- THIRD SEMESTER (2018-19 BATCH) JAN-2020

Initial Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	3	3	1	3	3	2	3	2	2	2	1	1	3
CO2	3	1	2	1	2	1	2	3	2	3	2	2	1	3
CO3	2	2	2	2	3	2	1	2	1	2	2	1	1	1
CO4	1	1	2	1	3	1	2	2	3	3	1	1	1	1
Weight Avarage	2.25	1.75	2.25	1.25	2.75	1.75	1.8	2.5	2	2.5	1.75	1.25	1	2
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
Quantity Culinary Arts														
WA	2.25	1.75	2.25	1.25	2.75	1.75	1.8	2.5	2	2.5	1.75	1.25	1	2

NAME OF COURSE: Food & Beverage Management

Paper Code	Subject	Corse Outcomes
BH-502	Food & Beverage Management	CO-1: Able to plan, coordinate and execute outdoor catering, operating food & beverage outlet, managing Bar operations for a variety of hospitality management events.
		CO-2 : Identification and develop new classical menus of cocktail & mixed drinks with the aid of critical thinking and able to prepare conventional cocktails
		CO-3: Comply with operating procedure with preparation and service of popular cocktail & organizing catering services with individual and team work, professional manner with social interaction by understanding the impact of hospitality and culinary science.
		CO-4: Develop the concept of Bar, supervisory skill, staffing and beverage preparation skill and sell hospitality services, product & guest experience.

PEOPLE'S COLLEGE OF HOTEL MANAGEMENT,CATERING TECHNOLOGY& APPLIED NUTRITION BHANPUR, BHOPAL														
Food & Beverage Management														
BBA(HHA)- FIFTH SEMESTER (2017-18 BATCH) JAN-2020														
Initial Mapping														
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	2	3	3	2	2	3	2	3	3	3	2	2	3
CO2	3	3	2	2	2	1	2	2	2	2	2	2	1	1
CO3	3	2	2	3	1	2	2	1	2	2	2	2	1	1
CO4	3	2	3	3	2	2	1	2	1	2	2	2	1	1
Weight Avarage	3	2.25	2.5	2.75	1.75	1.75	2	1.75	2	2.25	2.25	2	1.25	1.5
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
Food & Beverage Managements														
WA	3	2.25	2.5	2.75	1.75	1.75	2	1.75	2	2.25	2.25	2	1.25	1.5

NAME OF COURSE: Hospitality Marketing Management

Paper Code	Subject	Corse Outcomes
BH-707	Hospitality Marketing Management	CO-1: Able to plan, coordinate and execute outdoor catering, operating food & beverage outlet, managing Bar operations for a variety of hospitality management events.
		CO-2 : Identification and develop new classical menus of cocktail & mixed drinks with the aid of critical thinking and able to prepare conventional cocktails
		CO-3: Comply with operating procedure with preparation and service of popular cocktail & organizing catering services with individual and team work, professional manner with social interaction by understanding the impact of hospitality and culinary science.
		CO-4: Develop the concept of Bar, supervisory skill, staffing and beverage preparation skill and sell hospitality services, product & guest experience.

PEOPLE'S COLLEGE OF HOTEL MANAGEMENT,CATERING TECHNOLOGY& APPLIED NUTRITION BHANPUR, BHOPAL

Hospitality Marketing Management

BHMCT- SEVENTH SEMESTER (2017-18 BATCH) JAN-2020

Initial Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
CO1	3	2	3	3	2	2	3	2	3	3	3	2	2	3
CO2	3	3	2	2	2	1	1	2	2	2	2	2	1	1
CO3	3	1	2	3	1	2	2	1	2	2	2	2	1	1
CO4	3	2	3	1	1	2	1	2	1	2	2	2	1	1
Weight Avarage	3	2.25	2.5	2.75	1.75	1.75	2	1.75	2	2.25	2.25	2	1.25	1.5
Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14
Hospitality Marketing Management														
WA	3	2.25	2.5	2.75	1.75	1.75	2	1.75	2	2.25	2.25	2	1.25	1.5

PROGRAM OUTCOMES

B.Sc. Nursing- Undergraduate Nursing program is board based education within an academic framework specifically directed to the development of critical thinking skills, competencies and standards required for practice of professional nursing and midwifery as envisaged in National Health Policy .

Post Basic B.Sc. Nursing - Undergraduate nursing program at the post basic level is a broad based education within an academic framework, which builds upon the skills and competencies acquired at the Diploma level. It is specifically directed to the upgrading of critical thinking skills, competencies and standards required for practice of professional nursing and midwifery as envisaged in National Health Policy.

M.Sc. Nursing- Post graduate Program in nursing builds upon and extends competence acquired at the undergraduate levels, emphasizes application of relevant theories into nursing practice, education, administration and development of research skills. This program provides the basis for the Post Graduate program in Nursing. Further the program encourages accountability and commitment to lifelong learning which fosters improvement of quality care.

PROGRAM SPECIFIC OUTCOMES

B.Sc. Nursing - Undergraduate Nursing program prepares its graduates to become exemplary citizen by adhering to code of ethics and professional conduct at all times in fulfilling personal. Social and professional obligations so as to respond to national aspirations.

Post Basic B.Sc. Nursing- Under graduate nursing education program at the post basic level prepares its graduates to become exemplary citizen by adhering to code of ethics and professional conduct at all times in fulfilling personal, social and professional obligations so as to respond to national aspirations.

M.Sc. Nursing -The program prepares nurses for leadership position in nursing and health field who can function as nurse specialists, consultants, educators, administrators and researchers in a wide variety of professional settings in meeting the National priorities and the changing needs of the society

COURSE OUTCOMES

B.Sc. Nursing-

1) Apply knowledge from physical, biological and behavioral sciences medicine including alternative systems and nursing in providing nursing care to individuals, families and communities.
2) Demonstrate understanding of life style and other factors, which affect health of individual and groups.
3) Provide nursing care based on steps of nursing process in collaboration with the individual and groups.
4) Demonstrate critical thinking skill in making decisions in all situations in order to provide quality care.
5) Utilize the latest trends and technology in providing health care.
6) Provide promotive, preventive and restorative health services in line with the national health policies and programmes.
7) Practice within the framework of code of ethics and professional conduct, and acceptable standards of practice within the legal boundaries.
8) Communicate effectively with individuals and groups, and members of the health team in order to promote effective interpersonal relationships and teamwork
9) Demonstrate skills in teaching to individual and groups in clinical/community health settings.
10) Participate effectively as members of the health team in health care delivery system.
11) Demonstrate leadership and managerial skills in clinical/community health settings.
12) Conduct need based research studies in various settings and utilize the research findings to improve the quality of care.
13) Demonstrate awareness, interest and contribute towards advancement of self and of the profession.

Post Basic B.Sc. Nursing-

1) Assess health status, identify nursing needs,plan,implement and evaluate nursing care for patient/clients that contribute to health of individuals, families and communities.
2) Demonstrate competency in techniques of nursing based on concepts and principles from selected areas of nursing, physical, biological and behavioral sciences.
3) Participate as members of health team in the promotive, preventive, curative and restorative health care delivery system of the country.
4) Demonstrate skills in communication and interpersonal relationship.
5) Demonstrate leadership qualities and decision-making abilities in various situations.
6) Demonstrate skills in teaching to individuals and groups in community health settings.
7) Demonstrate managerial skills in community health settings.
8) Practice ethical values in their personal and professional life.
9) Participate in research activities and utilize research findings in improving nursing practice.
10) Recognize the needs for continued learning for their personal and professional development.

M.Sc. Nursing-

1) Utilize/apply the concepts, theories and principles of nursing science.
2) Demonstrate advance competence in practice of nursing.
3) Practice as a nurse specialist.
4) Demonstrate leadership qualities and function effectively as nurses educator and manager.
5) Demonstrate skill in conducting nursing research, interpreting and utilizing the findings from health related research.
6) Demonstrate the ability to plan and effect change in nursing practice and in the health care delivery system.
7) Establish collaborative relationship with members of other disciplines.
8) Demonstrate interest in continued learning for personal and professional advancement.

ELECTRONICS & COMMUNICATION ENGINEERING

Program Outcomes (POs):

- **PO1.Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals, and Electronics and Communication Engineering to the solution of complex Engineering problems.
- **PO2.Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3.Design/development of solutions:** Design & develop systems, formulate (anticipate)
  Model for problems and obtain engineering solutions.
- **PO4.Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and sustainability:** Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
- **PO8.Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
- **PO9.Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10.Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11.Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

MECHANICAL ENGINEERING

PROGRAMME OUTCOMES (POs):

- **PO1.Engineering Knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Mechanical Engineering to the solution of complex engineering problems.
- **PO2.Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3.Design/development of solutions:** Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4.Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and sustainability**: Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
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- **PO9.Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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- **PO11.Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

CIVIL ENGINEERING

Program Outcomes (POs):

- **PO1.Engineering knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Civil Engineering to the solution of complex Engineering problems.
- **PO2.Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of Mathematics, Natural sciences, and Engineering sciences.
- **PO3.Design/development of solutions:** Design & develop systems, formulate (anticipate) Model for problems and obtain engineering solutions.
- **PO4.Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and sustainability:** Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
- **PO8.Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
- **PO9.Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10.Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11.Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

COMPUTER SCIENCE & ENGINEERING

Program Outcomes (POs):

- **PO1.Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals, and Computer Science Engineering to the solution of complex Engineering problems.
- **PO2.Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3.Design/development of solutions:** Design & develop systems, formulate (anticipate)
  Model for problems and obtain engineering solutions.
- **PO4.Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and sustainability:** Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
- **PO8.Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
- **PO9.Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10.Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11.Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

ELECTRICAL ENGINEERING

Program Outcomes (POs):

- **PO1.Engineering knowledge:** Apply the knowledge of mathematics, science, Engineering fundamentals, and Electrical Engineering to the solution of complex Engineering problems.
- **PO2.Problem analysis:** Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.
- **PO3.Design/development of solutions:** Design & develop systems, formulate (anticipate)
  Model for problems and obtain engineering solutions.
- **PO4.Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5.Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and sustainability:** Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.
- **PO8.Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.
- **PO9.Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10.Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11.Project management and finance:** Demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

INFORMATION TECHNOLOGY

Program Outcomes (POs):

- **PO1.Engineering Knowledge:** Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Information Technology to the solution of complex Engineering problems.
- **PO2.Problem Analysis:** Identify, Formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of Mathematics, Natural Sciences, and Engineering Sciences.
- **PO3.Design/Development of Solutions:** Design & Develop Systems, formulate (anticipate) Model for problems and obtain engineering solutions.
- **PO4.Conduct Investigations of Complex Problems:** Use Research based knowledge and Research methods including design of Experiments, Analysis and interpretation of data, and Synthesis of the information to provide valid conclusions.
- **PO5.Modern Tool Usage:** Create, select, and apply appropriate Techniques, Resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
- **PO6.The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess Societal, Health, Safety, Legal and Cultural issues and the consequent responsibilities relevant to the professional Engineering practice.
- **PO7.Environment and Sustainability:** Understand the impact of the professional Engineering solutions in Societal and Environmental contexts, and demonstrate the knowledge of, and the need for sustainable Developments.
- **PO8.Ethics:** Apply Ethical principles and commit to professional Ethics and responsibilities and norms of the Engineering practice.
- **PO9.Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10.Communication:** Communicate effectively on complex Engineering activities with the Engineering Community and with Society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11.Project Management and Finance:** Demonstrate knowledge and understanding of the Engineering and Management Principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
- **PO12.Life -long learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of Technological change.

ELECTRONICS & COMMUNICATION ENGINEERING

Programme-Specific Outcomes (PSOs):

- **PSO1.**Apply the knowledge of Mathematics, Physics, Chemistry, Electronics and Communication to solve complex Engineering problems in Electronic Devices and Circuits, VLSI, Embedded Systems, Analog & Digital Communication and other associated topics.

- **PSO2.**Select and apply modern Engineering hardware and software tools to analyze complex Electronics and Communication Engineering problems and develop applications using Electronic Design Automation (EDA) tools.

- **PSO3.**Demonstrate a sense of professional ethics, recognize the importance of continued learning and be able to carry out their professional and entrepreneurial responsibilities in electronics engineering field giving due consideration to environment protection and sustainability

MECHANICAL ENGINEERING

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- **PSO1.**Apply their knowledge in the domain of Engineering Mechanics, Thermal and Fluid Sciences to solve Engineering problems utilizing advanced technology.

- **PSO2.**Ability to implement the learned principles of Mechanical Engineering to analyze, evaluate and create more advanced Mechanical Systems or Processes.

- **PSO3.** Develop and implement new ideas on product design and development with the help of Modern CAD/CAM tools, while ensuring best manufacturing practices.

CIVIL ENGINEERING

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- **PSO1.**Demonstrate Industrial Practices learned through Field Project.

- **PSO2.**Demonstrate Construction and Management Practices to solve Infrastructural development issues.

- **PSO3.**Utilized skills in Qualifying Competitive Exams and Demonstrating Leadership to Emerged as Potential Entrepreneur

COMPUTER SCIENCE ENGINEERING

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- **PSO1.**An ability to demonstrate basic knowledge of Database System, Software Engineering, Computer Networking and Operating System for Software Applications.

- **PSO2.**An ability to Design & Develop Program, Algorithms and Projects using Open Source tools and efficient Data Structure.

- **PSO3.**An ability to apply Standard Practices and Strategies in Software Project Development using Open-Ended Programming Environments to deliver a quality product for Business Success.

ELECTRICAL ENGINEERING

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- **PSO1.**Apply the knowledge of Mathematics, Science and Electrical Engineering Fundamentals to solve, analyze and design complex problems in Electrical Machines, Electrical Circuits, Control Systems, Power Systems, Analog and Digital Electronics.

- **PSO2.**Implement their knowledge in the domain of all Electrical Research Organization of Renewable Energy and Power Plants, and also determine their performance through testing and commissioning of EHT Substations and generating station.

- **PSO3.**Ability to understand the Recent Technological Developments in Electrical Engineering and develop new Products through Experimentation, Modeling and Presentation, useful to the Industry and the Society.

INFORMATION TECHNOLOGY

Programme-Specific Outcomes (PSOs):

- **PSO1.** Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking for efficient design of computer-based systems of varying complexity.

- **PSO2.** Practice modern computing techniques by continuous learning with ethical concern in establishing innovative career path as employee or employer.

- **PSO3.** Analyze and recommend the appropriate IT infrastructure required for the implementation of a project.

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			
BT-1101	Engineering Mathematics-I	3	1	0	External (70)	Internal (30)	Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total (Nil)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab work & Session– Max Marks: Nil	Assignment / Quiz/Attendance - Max. Marks: Nil

Pre-Requisite	Basic knowledge of function and continuity, Types of matrix, Elementary Differentiation and Integration.
Course Outcome	1. Identify, explain, and evaluate the use of elementary classroom manipulative to model sets, operations, and algorithms.
	2. Explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of the results.
	3. Maintain a core of mathematical and technical knowledge that is adaptable to changing technologies and provides a solid foundation for future learning.

Unit	Contents (Theory)	Marks Weightage
I	**Differential Calculus:** Successive Differentiation and Leibnitz's Theorem. Expansion of functions by Maclaurin's and Taylor's theorem. Partial differentiation. Euler's theorem. Maxima and Minima for one and two variable. Curvature: Radius of Curvature, centre of curvature.	**14**
II	**Integral Calculus :** Definite Integrals : Definite Integrals as a limit of a sum , its application in Summation of series, Beta and Gamma Functions , Double and Triple Integrals, Change of Order of Integration.	**14**
III	**Differential Equations:** Solution of Ordinary Differential Equation of first order and first degree (Equation in which variable are separable, Homogeneous Equation. Non homogeneous equation, Linear equation) Equation of first order and higher degree (Solvable for p, x and y, Clairaut's Equation), Linear Differential Equations of higher order with Constant Coefficients, Cauchy's, Homogeneous differential Equation, Simultaneous differential Equations.	**14**
IV	**Matrices:** Rank by Normal and Echelon form, Solution of Simultaneous linear equation of elementary transformation, Consistency of System of Simultaneous Linear Equation, Eigen Values and Eigen Vectors, Cayley-Hamilton theorem and its Application to find the inverse	**14**
V	**Vector Space:** Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.	**14**

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Text Book/References Books/ Websites

1. Ramana; Advance Engineering Mathematics; Tata McGraw hill.
2. B.S. Grewal; Higher Engineering Mathematics; Hanna Publication.
3. D.G.Guffy; Advance Engineering Mathematics.
4. S S Sastri.; Engineering Mathematics; P.H.I.
5. S.Arumungam; Mathematics for Engineers; SCITECH Publication.
6. Erwin Kreyszig; Advanced Engineering Mathematics; Wiley India.

Suggested List of Laboratory Practical (Expandable): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total (50)
BT-1102	Engineering Chemistry	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	External (35)	Internal (15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Session Max Marks: 10	Assignment / Quiz/Attendance Max. Marks: 05

Pre-Requisite	Students will be able to explore new areas of research in both chemistry and allied fields of science and Technology.
Course Outcome	1. Have firm foundations in the fundamentals and application of current chemical and scientific theories.
	2. Are able to design, carry out, record and analyze the results of chemical experiments.
	3. Are able to use modern instrumentation and classical techniques, to design experiments, and to properly record the results of their experiment.

Unit	Contents (Theory)	Marks Weightage
I	**Lubricants:** Introduction, Mechanism of lubrication, Classification of lubricants, Properties and Testing of lubricating oils, Numerical problems based on testing methods. Cement & Refractory: Manufacture, IS-code, Setting and hardening of cement, Refractory : Introduction, classification and properties of refractory.	**14**
II	**Water And Its Industrial Applications**: Sources, Impurities, Hardness & its units, Industrial water characteristics, softening of water by various methods (External & Internal treatment), Boiler trouble causes, effect & remedies, Characteristics of municipal water & its treatment, Numerical problems based on softening methods.	**14**
III	**Water Analysis Techniques**:- Alkalinity, Hardness (complex metric), Chloride, Free Chlorine, DO, BOD and COD, Numerical problems based on above techniques. Instrumental techniques in Chemical Analysis: Introduction, Principle, Instrumentation and applications of IR, UV, Gas, Chromatography, Lambert's and Beer's Law.	**14**

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

IV	**Fuels & Combustion:** Fossil fuels & classification, Calorific value, Determination of calorific value by Bomb calorimeter Proximate and Ultimate analysis of coal and their significance, calorific value Computation based on ultimate analysis data, Carbonization, Manufacturing of coke & recovery of by products. Cracking of higher Hydrocarbons & mechanism of cracking, Knocking, relationship between' knocking & structure of hydrocarbon, improvement • of anti knocking characteristics of IC engine fuels, Diesel engine fuels, Cetane number, combustion and it related numerical problems.	**14**
V	**High-Polymer** : Introduction, types and classification of polymerization, Reaction Mechanism, Natural & Synthetic Rubber; Vulcanization of Rubber, Preparation, Properties & uses of the following- Polythene, PVC, PMA, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon, Nylon 6:6, Terylene, Phenol formaldehyde, Urea - Formaldehyde Resin, Glyptal, Polyurethanes; Butyl Rubber, Neoprene, Buna N, Buna S. Flow sheet manufacturing diagram of Nylon 6:6 & Decoran.	**14**

Text Book/References Books/ Websites

1. Jain and Jain;Dhanpat Rai Publications Engineering Chemistry
2. B K Sharma; Goel Publication Industrial Chemistry
3. S S Dara; S.Chand Publication Environmental Chemistry & Pollution Control;
4. Shashi Chawla; Dhanpat Rai Publications Engineering chemistry

Suggested List of Laboratory Experiments (Expandable):

1. Determine the type and extent of Alkalinity of given sample of Water by N/50 Sulphuric acid When [P>1/2 M]
2. Determine the type and extent of Alkalinity of given sample of Water by N/50 Sulphuric acid When [P<1/2 M]
3. Determine the total Hardness of the given Water sample B Water Sample A contains 0.8234 gm $CaCO_3$ Equivalent per litre standrized the EDTA Solution and. Report your answer in ppm (Complexometric Titration)
4. Determine the Chloride ion in a given Water sample by Argentometric method.
5. Determine the strength (gm/litre) of supplied $CuSO_4.5H_2O$ solution B Normality of provided solution A ($CuSO_4.5H_2O$) is N/20 and using intermediate Hypo solution .
6. . Determine the strength of $FeSO_4(NH_4)_2 SO_4.6H_2O$ solution B, solution A is standard N/20 Mohr's salt $FeSO_4(NH_4)_2 SO_4.6H_2O$ using intermediate potassium dichromate solution. Diphenylamine as an indicator.
7. Determine the flash point and fire point of given Lubricating oil by Abel's Apparatus.
8. Determine the flash point and fire point of given Lubricating oil by Cleveland's Apparatus.
9. Determine the flash point and fire point of given Lubricating oil by Pensky Marten's Apparatus..
10. Determine the effect of temperature on the viscosity of the given Lubricating oil using Redwood Viscometer No. 1.
11. Determine the effect of temperature on the viscosity of the given Lubricating oil using Redwood Viscometer No. 2.
12. Determine the Cloud and Pour point of given lubricating oil.
13. Determine the moisture content, volatile matter, ash content and fixed carbon in a given coal sample.

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total (50)
BT-1103	Communication Skills	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	External (35)	Internal (15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional– Max Marks: 10	Assignment/ Quiz/Attendance – Max. Marks: 05

Pre-Requisite	Nil
Course Outcome	The course will equip the students with the necessary communication skills (reading, writing, listening, and spoken language) that would help student in their profession.

Unit	Contents (Theory)	Marks Weightage
I	**Communication:** Nature, Process and Importance of Communication, Channels of Communication Network, Media of Communication, Verbal and Non-Verbal Communication, Barriers to Communication.	**14**
II	**Listening**: Process of Listening, Barriers to Listening, Types of Listening, Benefits and techniques of effective Listening, Phonetics and phonetics transcription.	**14**
III	**Business letter**: Enquiry, quotation, Order, complaint and adjustment letters, Tender, Noting and drafting, Comment, speech, Job application, resume writing.	**14**
IV	**Report Writing**: Techniques of report writing, and Types of reports--Project report, Observation report, Survey report, Laboratory report, Event and Incident report.	**14**
V	**Advertisement**: Advertisement, slogan writing, Paragraph writing Precise writing, Role play, telephonic conversation, Definitions of common technical and scientific terms.	**14**

Text Book/References Books/ Websites:

1. Dr. Gajanan Malviya & Prof R. N.Shukla; Communication Skills; S. Chand & Company Delhi.
2. R Rizvi ;Professional Communication;TMH.
3. Sharma & Mohan ;Business Correspondence Letter Writing; TMH.
4. Sharma; Business Correspondence and Report Writing; TMH.
5. W.S. Allen; Living English Structure; Longmans.
6. R.K. Bansal and IB Harrison Orient Longman ;Spoken English for India.
7. Joans and Alexander;New International Business English ;OUP.
8. Rizvi; Effective Technical Communication;TMH.

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Programme: Bachelor of Technology **Semester –I/II**

Suggested List of Laboratory Experiments :(Expandable)

1. Basic Grammar and Vocabulary practice
2. Translation
3. Reading, writing, listening and speaking skills practice
4. Body Language
5. Oral presentation and interview skills
6. Public speaking

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (35)	Internal (15)	Total (50)
BT-1104	Basic Electrical & Electronics Engineering	3	1	1			Min: 40 (D Grade)			Min:20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment/ Quiz/Attendance – Max. Marks: 05

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Outcome	1. Predict the behaviour of any electrical and magnetic circuits.
	2. Formulate and solve complex AC, DC circuits. Identify the type of electrical machine used for that particular application.
	3. Realize the requirement of transformers in transmission and distribution of electric power and other applications.

Unit	Contents (Theory)	Marks Weightage
I	**Electrical Circuit Analysis:** Voltage and current sources, dependent and independent sources, sources conversion, Kirchhoff's law (KVL & KCL) ,Ohms law DC circuit analysis using Mesh & Nodal Method, Thevenin's & superposition theorem, Maximum Power transfer theorem for dc source, star-delta Transformation. Introduction of single & Three Phase AC circuit, properties Resistor inductor and capacitor and its characteristics, active, reactive & apparent Power and power factor and its importance, 3- phase balanced and unbalanced supply in star delta connection, measurement of power by two and three wattmeter method.	**14**
II	**Transformer:** Review of laws of electromagnetism, mmf , flux , and their relation , analysis of magnetic circuits, Single phase transformer, basic concepts and construction features, voltage, current and impedance transformation, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency, OC and SC Test ,Autotransformer.	**14**
III	**Rotating Electric Machines:** Constructional details of DC machine, type of dc machine EMF equation of DC machine, Constructional details of Induction Machine and Synchronous machine working principle of 3-phase induction motor Torque equation of 3-phase induction motor, concept of slip in 3-phase induction motor, Explanation of Torque-slip characteristics of 3-phase induction motor. Working principle Synchronous machine.	**14**
IV	**Semiconductor Materials:** Classification of solid materials. Insulators, metal and semiconductor on the basis of band gap. Comparison of conductors, insulators and semiconductors. **Classification of semiconductors**: Intrinsic and Extrinsic. N-type and P-type semiconductors. Effect of temperature on extrinsic semiconductors .PN junction diode. Biasing of PN junction diode. V-I characteristics of diode. Effect of temperature on the V-I characteristics. diode as a rectifier.	**14**
V	**Special diodes and Transistor:** Zener diode, Tunnel diode, PIN diode, LED & photodiode. **Transistor**: Transistor symbols, types of transistor and their working. Modes of operation o transistor. Transistor configurations, relation between current gains of different configuration Comparison of three transistor configuration. Transistor as an Amplifier. **Digital Electronics**	**14**

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Programme: Bachelor of Technology **Semester –I/II**

	Number systems, Gates, Universal gates**,** Demorgan's Theorem , SOP and POS.	

Text Book/References Books/ Websites:

1. Vincent Del Toro; Electrical Engineering Fundamentals;PHI Learning, II Edition.
2. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
3. V.K.Mehta; Principles of Electronics ;S.Chand & Company.
4. Nagrath & Kothari; Basic Electrical Engineering; III Edition TMH.
5. Hughes; Electrical and Electronic Technology; Pearson Education IX Edition.
6. Navneet Gupta; Basic Electronics ; Dhanpat rai & company.
7. R.P.Jain ;Digital Electronics;TMH Publication.
8. Natrajan & Ramesh Babu ;Electrical & Electronics Engineering ;SCITECH Publication.

Suggested List of Laboratory Experiments :- (Expandable):

1. Verifications of Thevenin's and Superposition theorems.
2. Study of Transformer, name plate rating, determination of ratio and polarity.
3. Determination of O.C and s.c test of single phase transformer.
4. Determination of ratio and polarity test of single phase transformer.
5. Separation of resistance and inductance of choke coil.
6. Measurement of various line & phase quantities for a 3-phase circuit.
7. Study of various electronic components.
8. Study of V-I characteristics of diodes.
9. Study of Transistors.
10. Study of Zener diodes.
11. Verification of truth table for Gate (AND, OR, NOT, EX-OR, NOR, NAND).

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total (50)
BT-1105	Engineering Drawing	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	External (35)	Internal (15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment / Quiz Max. Marks: 05

Pre-Requisite	**Nil**
Course Outcome	4. Ability to understand Ability to perform basic sketching techniques will improve.
	5. Ability to draw orthographic projections and sections.
	6. Ability to understand Auto CAD two dimensional drawings.

Unit	Contents (Theory)	Marks Weightage
I	**Basic Geometrical Construction : Scales:** Representative factor, plain scales, diagonal scales, scale of chords. ***Conic* Sections:** Construction of ellipse – General method, Arc of circle method. **Parabola:** General method, Tangential method, Rectangle Method. **Hyperbola:** General method, Intersecting arcs method, Normal and Tangent of conic section. **Special Curves :** Cycloid, Epicycloids, Hypocycloid, Involutes, Archimedean spiral.	**14**
II	**Projection:** Types of Projections, Orthographic Projection, First and Third angle Projection. Projections of Points & straight Lines, Line inclined to one plane, Inclined with both the planes, True length and True inclination and Traces of straight lines.	**14**
III	**Projections of Planes and solids:** Projections of planes like circle and polygons in different positions, Projection of Polyhedrons like Prisms, Pyramids and Solid of revolutions like Cylinder, Cone in different positions.	**14**
IV	**Section of Solids:** Section of right solid by normal and inclined planes. **Development of** surfaces**:** Parallel line and Radial line method for Right solid-prisms, Pyramids and Cone. Isometric projection: Isometric scale, Isometric axes, Isometric projection from Orthographic drawing.	**14**
V	**Introduction of Engineering Drawing Softwares -Computer Aided Drafting (CAD):** Introduction to Computer Aided Drafting software for 2D and 3D Modeling, Benefits, software's basic commands of drafting entities like Line, Circle, Polygon, Polyhedron, Cylinders. Transformations and Editing commands like Move, Rotate, Mirror, Array. Introduction of Pro-E and CATIA.	**14**

Text Book/References Books/ Websites

1. Gill P.S. Engineering Drawing, Kataria.
2. Bhatt N.D. Engineering Drawing, Charotar.
3. Agrawal and Agrawal, Enginnering Drawing, TMH.
4. Visvesvaraya Tech. University, A Premier on Computer Aided Engg Drawing.
5. Venugopal K. Engineering Graphics, New Age.
6. John KC, Engg Graphics for Degree, PHI.

7. Jeyopoovan T, Engineering drawing & Graphics Using AutoCAD, Vikas

Suggested List of Laboratory Experiments (Expandable):

Perform drawing skills on A-2 size sheet of concern topics. (Min 10 sheets).

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total	External (70)	Internal (30)	Total (100)
BT-1106	Mechanical Workshop	0	0	2	Nil	Nil	Nil			Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Sessional – Max Marks: 20	Assignment / Quiz Max. Marks: 10

Pre-Requisite	**Nil**
Course Outcome	1. Study the basic knowledge of Measurements.
	2. Study the Engineering processes of machine tools and their operations.
	3. Ability to understand construction, function, use and application of different working tools, equipment and machines.

Unit	Contents (Theory)	Marks Weightage
I	**Study of Mechanical tools and components and their Application** 1.Measurement: 1.1 Vernier caliper 1.2 Micrometer 1.3 Dial gauge 1.4 Slip gauge 1.5 Sine-bar 1.6 Combination set.	**14**
II	**Carpentry Shop** 2.0 General Shop Talk 2.1 Name and use of raw materials used in carpentry shop: wood & alternative materials 2.2 Names, uses, care and maintenance of hand tools such as different types of Saws, 'G'-Clamp Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.	**14**
III	**Smithy/ Forging Shop** 3. General Shop Talk 3.1 Purpose of Smithy / Forging Shop 3.2 Different types of Hearths used in Smithy / Forging shop 3.3 Purpose specifications uses, care and maintenance of various tools and equipments used in hand forging by segregating as cutting tools, supporting tools, holding tools etc. 3.4 Types of fuel used and maximum temperature obtained 3.5 Types of raw materials used in Smithy / Forging shop 3.6 Uses of Fire Bricks & Clays in Forging Work Shop	**14**
IV	**Welding Shop** 4. General Shop Talk 4.1 Purpose of Welding, Brazing and Soldering.	**14**

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Programme: Bachelor of Technology **Semester –I/II**

	4.2 Purpose, specifications, uses, care and maintenance of various Welding machines, Cables, tools and equipments used for welding, brazing and soldering (soft and hard) 4.3 Purpose of fluxes, electrodes, filler rods 4.4 Safety equipments used in Welding Shop **Bench Work & Fitting Shop** 5. General Shop Talk Purpose of Bench Work and Fitting Shop: (a) Study of different types of hand tools & their uses, care and maintenance of tools e.g. Files, Chisels, Hammers, Hack-saw with frames, Fitting Bench Vice, Different other Vices, Divider, Trysquare, Drill-taps, Dies, V-blocks, Bevel protector, Scribers, Surface plates, Types of Callipers Types of Drill bits etc.	
V	**Machine:** Demonstrations and application of drilling machine, Grinding Machine, Shapping Machine, Milling Machine, and lathe Machine etc.	**14**

Text Book/References Books/ Websites

1. Hazara Choudhary; Workshop Practices; Vol. I & II.
2. R.K. Jain; Production Technology.
3. H.S. Bawa; Workshop Practice;TMH .
4. P.N. Rao; Manufacturing Technology- Vol.1& 2;TMH.
5. K.C. John; Mechanical workshop practice; PHI.
6. Priti Agrawal; Electrician Practical; NK.
7. GK Mittal; Electrical Engineering material; Khanna Publication, 2011.

Suggested List of Laboratory Experiments : (Expandable): Nil

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (50)			Total
BT-1107	Disaster Management and Safety	2	0	0	External (35)	Internal (15)	Min: 40 (D Grade)	External Nil	Internal Nil	Nil

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance Max. Marks: Nil

Pre-Requisite	**Nil**
Course Outcome	1. Understanding foundations of hazards; disasters and associated natural/social phenomena.
	2. Familiarity with disaster management theory.
	3. Technological innovations in Disaster Risk Reduction: Advantages and problems.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction Disasters:** Understanding the Concepts and definitions of Disaster; Hazard; Vulnerability; Risk and Capacity – Disaster and Development; and disaster management.	**07**
II	**Types, Trends, Causes, Consequences and Control of Disasters:** Geological Disasters (earthquakes; landslides; tsunami; mining); Hydro-Meteorological Disasters (floods; cyclones; lightning; thunder-storms; hail storms; avalanches; droughts; cold and heat waves) Biological Disasters (epidemics; pest attacks; forest fire); Technological Disasters (chemical; industrial; radiological; nuclear) and Manmade Disasters (building collapse; rural and urban fire; road and rail accidents; nuclear; radiological; chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.	**07**
III	**Disaster Management Cycle and Framework 8 Disaster Management Cycle –** Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis; Risk Mapping; zonation and Microzonation; Prevention and Mitigation of Disasters; Early Warning System; Preparedness; Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment; Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment.	**07**
IV	**Disaster Management in India:** Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management; National Guidelines and Plans on Disaster Management; Role of Government (local; state and national);Non-Government and Intergovernmental Agencies.	**07**
V	**Applications of Science and Technology for Disaster Management :** Geo-informatics in Disaster Management (RS; GIS; GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India; Role of Engineers in Disaster Management.	**07**

 # Mandatory (Non Credit) subject according to AICTE. Non University Examination; End Sem marks not to be included in total marks and credit. Students must pass in this subject.

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Programme: Bachelor of Technology **Semester –I/II**

Text Book/References Books/ Websites

1. M C Gupta;Manual on natural disaster management in India; NIDM; New Delhi
2. R K Bhandani;An overview on natural & man-made disasters and their reduction; CSIR New Delhi .
3. World Disasters Report; 2009.
4. Encyclopedia of disaster management; Vol I; II and III
5. S L Goyal; Disaster management policy and administration; Deep & Deep New Delhi; 2006.
6. Anu Kapur & others; Disasters in India Studies of grim reality; 2005, 283 pages; Rawat Publishers; Jaipur.
7. H.N. Srivastava & G.D. Gupta ;Management of Natural Disasters in developing countries;Daya Publishers; Delhi; 2006; 201 pages.
8. Disaster Management Act 2005; Publisher by Govt. of India.
9. National Disaster Management Policy; 2009; GoI

Suggested List of Laboratory Experiments (Expandable): Nil

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
BT-1201	Environmental science	3	1	0	(70)	(30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal-Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance- Max. Marks: 10
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: Nil	Assignment / Quiz/Attendance- Max. Marks: Nil

Pre-Requisite	Nil
Course Outcome	1. Ability to understand the challenges and technologies in Environmental science use.
	2. To understand the environmental recourses and its consequences.
	3. To understand the energy use and the exploitation of energy resource,

Unit	Contents (Theory)	Marks Weightage
I	**Energy resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles .The multidisciplinary nature of environmental studies Definition, scope and importance, Need for public awareness.	**14**
II	**Ecosystems** · Concept of an ecosystem · Structure and function of an ecosystem · Producers, consumers and decomposers · Energy flow in the ecosystem · Ecological succession · Food chains, food webs and ecological pyramids · Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)	**14**
III	**Biodiversity and its conservation** - Introduction – Definition: genetic, species and ecosystem diversity · Bio-geographical classification of India · Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values · Biodiversity at global, national and local levels · India as a mega-diversity nation · Hot-spots of biodiversity · Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts · In-situ and Ex-situ conservation of biodiversity.	**14**
IV	**Environmental Pollution Definition** · Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution · Solid waste management: Causes, effects and control measures of urban and industrial wastes. · Role of an individual in prevention of pollution · **Disaster management**: floods, earthquake, cyclone and landslides.	**14**
V	**Environmental Policy, Legislation, Rules And Regulations :**National Environmental Policy Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act-1981, Water (Prevention and Control of pollution) Act-1974, Water pollution Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .	**14**

Text Book/References Books/ Websites:

1. Dr. S. S. Dara and Dr. D. D. Mishra; A textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
2. Dr. Suresh K. Dhameja; Environmental studies; S K Kataria and Sons.
3. A. Ristinen and Jack J. Kraushaar; Energy and the Environment,2nd Edition: Robert.

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Programme: Bachelor of Technology **Semester –I/II**

4. Anindita Basak ; Environmental Studies; Pearson Publications.
5. Gilbert M. Masters; Introduction to Environmental Engineering and Science; Prentice-Hall Publications.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total (50)
BT-1202	Engineering Physics	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	External (35)	Internal (15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Session– Max Marks: 10	Assignment / Quiz/Attendance - Max. Marks: 05

Pre-Requisite	Fundamental knowledge of physics and physical principles for development, design and analysis.
Course Outcome	1. Understand concept and knowledge of Laser and Fiber Optics and its industrial applications.
	2. Apply principles and concept of nuclear and particle physics for solving various engineering problems.
	3. Analyze the intensity variation of light due to Polarization, Interference and Diffraction.

Unit	Contents (Theory)	Marks Weightage
I	**Laser and Fiber Optics:** Introduction, Interaction of radiation with matter, Conditions for light amplification, population inversion, active medium, pumping, Optical resonators, pumping schemes, characteristics of laser beam, applications of laser, Types of lasers: Ruby & He- Ne. Introduction of optical fiber, applications & types of optical fiber, Propagation of light through a cladded fiber, acceptance angle, cone, numerical aperture, V Number, attenuation and fiber losses.	**14**
II	**Wave Optics:** Interference: Condition for interference, coherence, Young's double slit experiment, Interference in parallel thin films, Newton's rings and their applications. Fraunhofer Diffraction: single slit and grating, Resolving Power, Resolving Power of telescope and grating, polarization of light, Production of plane polarized light by reflection, Brewster law, Production of elliptically and circularly polarized light.	**14**

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Programme: Bachelor of Technology **Semester –I/II**

III	**Nuclear Physics:** Atomic Nucleus, Nuclear density, Atomic mass unit, mass defect, Binding energy, Nuclear Models: liquid drop model, shell model, Accelerators: Drift tube LINAC, Cyclotron, Synchrotron, Synchrocyclotron & Betatron, Nuclear Fission, Chain Reaction, Q- Value, Nuclear Fusion, Nuclear Reactor, Geiger - Muller Counter, Bainbridge Mass Spectrograph.	**14**
IV	**Quantum and Nano Physics:**De Broglie Hypothesis, Group and particle velocities & their relationship. Uncertainty principle and its application, Compton Effect, Wave function, Quantum operators, time dependent and time independent Schrödinger wave equation, Application of time independent Schrödinger wave equation for a particle trapped in a one dimensional square potential well. Introduction of nanophysics, concept of nanostructures and materials, characterization, applications and future of nanotechnology	**14**
V	**Solid State Physics and Superconductivity**: Kronig Penny Model (Without Derivation), Band theory for solids, Fermi Dirac distribution function, Fermi level of intrinsic and extrinsic semiconductor, PN Diode, Zener diode, photodiode, solar cell, Hall effect. Superconductivity: Introduction, Meissner effect, Type I and Type II superconductors, BCS theory, Josephson Effect, applications of superconductors.	**14**

Text Book/References Books/ Websites

1. M.N. Avadhanulu; Engineering Physics; S Chand Pub.
2. Beiser; Concepts of Modern Physics; McGraw-Hill
3. Navneet Gupta, S.K.Tiwary; Engineering Physics; Dhanpat Rai & Co.
4. Edward L. Wolf; Nanophysics and Nanotechnology; Wiley India

Suggested List of Laboratory Experiments (Expandable):

1. He- Ne Laser: Width of slit
2. NA of Fiber
3. Newton's Ring Apparatus: Wavelength of Sodium Lamp
4. Grating: Measurement of Wavelength
5. Resolving Power: Telescope & Grating
6. Polarimeter: Determination of Specific rotation
7. Spectrometer: Refractive index of Prism
8. Energy Band Gap: Semiconductor
9. PN Diode : Characteristic Curve
10. Zener Diode: Characteristic Curve
11. Hall Effect Experiment
12. Photo Cell: Determination of Planck's constant
13. Sextant: Height of Building
14. Electrical Vibrator: Frequency of AC Mains

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total (50)
BT-1203	Elements of Mechanical Engineering	3	1	0	External (70)	Internal (30)	Min: 40 (D Grade)	External (35)	Internal (15)	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance- Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment / Quiz/ Attendance- Max. Marks: 05

Pre-Requisite	Nil
Course Outcome	1. Grasp the concept of stresses and strains.
	2. Understand the basics of thermodynamics and I.C. Engines.
	3. Ability to understand the concept of Forces and Equilibrium.

Unit	Contents (Theory)	Marks Weightage
I	**Materials:** Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon Diagram. Alloy steels their applications. Mechanical properties, Stress-strain diagram of ductile and brittle materials, Hooks law and modulus of elasticity, Tensile, hardness and fatigue testing of Materials.	**14**
II	**Thermodynamic**: Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy. **Refrigeration:** Vapour Absorption and Compression cycle, Coefficient of performance, Refrigerants properties and Eco-friendly Refrigerants.	**14**
III	**Reciprocating Machines:** Working principle of steam Engine, Carnot, Otto, Diesel cycle with P-V, T-S diagrams and their efficiency, Working of Two stroke & Four stroke Petrol & Diesel engines. **Steam Engineering:** Classification and working of boilers, mountings and accessories of boilers, steam properties, use of steam tables.	**14**
IV	**Forces and Equilibrium**: Graphical and Analytical Treatment of Concurrent and non concurrent, Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems.	**14**
V	**Centre of Gravity and moment of Inertia**: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.	**14**

Text Book/References Books/ Websites

1. C M Agrawal; Basic Mechanical Engineering ;Wiley Publication.
2. W. Ganesan; Internal Combustion Engines; TMH.
3. R.C. Hibbler; Engineering Mechanics; Statics & Dynamics.
4. R.K. Rajput ;Engineering Mechanics ;S.Chand & Co..
5. Langley, Billy C., 'Solid state electronic controls for HVACR' Prentice-Hall 1989.

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Suggested List of Laboratory Experiments :- (Expandable): Nil

1. To study the working and construction details of Cochran and Babcock & Wilcox Boiler
2. To study Two-Stroke & Four-Stroke Diesel Engines.
3. To Study Two-Stroke & Four-Stroke Petrol Engines.
4. To study different types of Boilers Mountings and accessories
5. To study simple steam engine single.
6. To verify law of Polygon of forces.
7. To determine the Moment of inertia of fly wheel by falling weight method.
8. To determine the Center of Gravity of a given Lamina.
9. To verify Bending Moment at a given section of a simply supported beam.
10. To determine the Coefficient of Friction Between two given surfaces of Horizontal plane Method.

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total 100			Total (50)
BT-1204	Basic Civil Engineering	3	1	1	External (70)	Internal (30)	Min 40 D Grade)	External (35)	Internal (15)	Min 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test - Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	**Nil**
Course Outcome	1. To know about the knowledge of building material and its construction.
	2. To know about the different survey for any construction.
	3. To give the knowledge of advance instrument looking to the current scenario.

Unit	Contents (Theory)	Marks Weightage
I	**Engineering Materials:** Stones, Bricks, Cement, Lime, Timber, Mortar and Concrete-types, basic properties, tests & uses.	**14**
II	**Building construction:** Sub and super structure of a building, Types of Foundations, Types of Brick and Stone masonry, Planning & Orientation of building, Plastering and Pointing, Concept of Green Building.	**14**
III	**Surveying & Positioning:** Introduction to Surveying- Classification, Fundamental Principles, & Instrument Used, Linear measurement by Chain survey, Angular measurement by Compass survey, Measurement of elevation by levelling,	**14**
IV	**Remote Sensing & GIS:** Introduction of Remote sensing & its applications in civil Engineering, GIS , GPS, its application in Civil Engineering	**14**
V	**Mapping:** Mapping details and contouring, Profile cross sectioning and measurement of area Volume, numerical problems. Application of measurements in quantity computations,	**14**

Text Book/References Books/ Websites:

1. S Ramamrutham; Basic Civil Engg;Dhanpat Rai Publishing.
2. B C Punamia & Ashok Jain; Basic Civil Engg.;Laxmi Publications.
3. S.S. Bhavikatti; Basic Civil Engineeing; New Age Publications.
4. N.N. Basak; Basic Civil Engineering; TMH Publisher.

Suggested List of Laboratory Experiments :(Expandable)

1. To determine the Shape and size of clay burnt brick.
2. To determine the Water absorption of given brick.
3. To determine the Compressive strength of bricks.
4. To find the Fineness of give port land cement.
5. To determine the Specific gravity of cement using LeChatelier Flask.
6. To find the Soundness of a given cement.
7. To find the Initial and final setting time of cement.

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Programme: Bachelor of Technology **Semester –I/II**

8. To Know the Workability of fresh concrete by slump cone apparatus.
9. To determine the Compressive strength of fresh Cement Concrete block.

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Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total (100)	External (35)	Internal (15)	Total (50)
BT-1205	Basic Computer Engineering	3	1	1			Min: 40 (D Grade			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test-- Max Marks: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment/ Quiz/Attendance Max. Marks: 05

Pre-Requisite	**Nil**
Course Outcome	1.Student understand operating system concepts, peripheral devices, internet, computer networking
	2.Understand basic data types and the benefits of object oriented programming.
	3.Have the ability to write a computer program to solve specified problems.

Unit	Contents (Theory)	Marks Weightage
I	**Computer:** Definition, Generation, Classification, Von Neumann Model and its architecture, organization, system and application software, introduction to windows, MS DOS, MS OFFICE(word, excel, power point and access) and internet	**14**
II	**Operating System**: Definition, function and types, management of process, memory and file, case study of UNIX and LINUX, case study of DOS and windows	**14**
III	**Computer Networking**: Introduction to data communication, computer networking, goals, data communication concepts ,introduction to layering and protocols, ISO-OSI Model, function of different layers, internetworking concepts, devices, TCP/IP Model, introduction to internet, world wide web, network security, E- commerce`	**14**
IV	**Programming Languages**: Generations, characteristics and categorization, Introduction to programming, procedure oriented programming Vs object oriented programming ,OOPS features, Concept of Inheritance and its types, Virtual function, OOPS Merits.	**14**
V	**Features of C and C++: C**haracter, tokens, program structure, data types, variables, operators, expression, statements and control structures, arrays, functions, structures, Difference between C and C++.	**14**

Text Book/References Books/ Websites

1. Peter Norton;Introduction of Computers; TMH
2. E.Balagurusamy;Object Oriented Programming with C++;TMH
3. Rajesh K.Shukla;Object Oriented Programming in C++;Wiley India
4. Andrew Tananbaum;Computer Networks; PHI

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(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Suggested List of Laboratory Experiments :- (Expandable)

1. Study of Microsoft Disk operating system with all Internal and external commands
2. Write a procedure to create biodata in MS Word
3. Create a presentation of 10 slides describing Independence Day Celebration in your college
4. Write a procedure to create a spreadsheet in MS Excel
5. Write a program to print text.
6. Write a program to read two numbers and print sum of given two numbers
7. Write a program to accept student roll no, marks in 3 subjects and calculate total, average and print it
8. Write a program to read a three numbers and print the biggest of given three numbers
9. Write a program to read a number and find whether the given number is even or odd.
10. Write a program to accept a number and check the given number is Armstrong or not.

Subject Code	Subject Title	Credit	Theory	Practical

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

BT-1206	**Soft Skills**	**L**	**T**	**P**	**External (Nil)**	**Internal (Nil)**	**Total (Nil)**	**External (70)**	**Internal (30)**	**Total (100)** Min: 40 (D Grade)
		-	-	2						

Duration of Theory (Externals):Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test– Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 30	Lab work & Session– Max Marks: 20	Assignment / Quiz/Attendance- Max. Marks: 10

Pre-Requisite	**Nil**
Course Outcome	7. To inculcate good manners and etiquettes to make students more flexible and capable to change before entering the professional work environment
	2. Enhance holistic development of students and improve their employability skills.

Unit	**Contents (*Theory*)**	**Marks Weightage**
I	Introduction to soft skills, its importance in today's world; art of introduction, perception and personality(with examples of national and world leaders in politics and business),grooming personal appearance, diversity, inclusiveness, gender sensitivity, taking initiatives.	**100**
II	Importance of communication and non-verbal communication, courtesy, flexibility, Public speaking, handling criticism, professionalism, work ethics, punctuality, willingness to learn.	
III	Emotional quotient & emotional intelligence: meaning and importance, 5 elements of EQ, how to improve and its advantages.	
IV	Professional skills: stress management, time, management, problem solving , critical thinking, team spirit positive attitude, Goal setting, Networking,	
V	Oral presentation: planning and preparation, job interview: preparing questions, group discursion, debate, extempore.	

Text Book/References Books/ Websites

1. Butterfield,Jeff;Soft Skills for Everyone. New Delhi; Cengage Learning.2010.
2. Chauhan, G.S. and Sangeeta Sharma;Soft Skills. New Delhi;Wiley.2016.
3. Holtz,Shel;Corporate Conversations. New Delhi; PHI. 2007.
4. Turk, Christopher; Effective Speaking. South Asia Division; Taylor & Francis.1985.
5. Lucas, Stephen E;The Art of Public Speaking;McGeaw-Hill Book Co. International edition, 2014.

Suggested List of Laboratory Experiments :(Expandable) Nil

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(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: Bachelor of Technology **Semester –I/II**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total			Total (50)
BT-1207	Physical Education & Yoga	-	-	1	External (Nil)	Internal (Nil)	(Nil)	External (Nil)	Internal (50)	Min: 20 (D Grade)

Duration of Theory (Externals):

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab work & Session– Max Marks: Nil	Assignment / Quiz/Attendance - Max. Marks: 50

Pre-Requisite	Nil
Course Outcome	To improving concentration and stress bust

Unit	Contents (Theory)	Marks Weightage
I	**Yoga:** Meaning & Importance of Yoga, Elements of Yoga. Introduction – Asanas & Meditation. Yoga for concentration & related Asanas (Sukhasana, Tadasana, & Padmasana), Relaxation Techniques for improving concentration – Yog-nidra. Asanas as preventive measures: 1. Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardh-Matsyendrasana. 2. Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavanmuktasana, Ardh- Matsyendrasana. 3. Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana. 4. Back Pain: Tadasana, Ardh-Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.	**50**
II	**Sports:** Any two games: Students are required to play two games out of the listed sports:Badminton,Table Tennis, Volleyball ,Football, Basketball ,Kabaddi,Kho-Kho	

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Experiments :- (Expandable):

1 Any one game of your choice out of the list above. Labeled diagram of field & equipment Rules, Terminologies & Skills.

PEOPLE'S UNIVERSITY, BHOPAL

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Programme: **Bachelor of Technology** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)			Total
BT-1301	Engineering Mathematics-II	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab work & Session – Max Marks: Nil	Assignment / Quiz/Attendance - Max. Marks: Nil

Pre-Requisite	Fundamental knowledge of mathematics such as algebra and trigonometry.
Course Outcome	1. Experience mathematics outside of your regular course work.
	2. Use knowledge and skills necessary for immediate employment or acceptance into a graduate program.
	3. Maintain a core of mathematical and technical knowledge that is adaptable to changing technologies and provides a solid foundation for future learning.

Unit	Contents (Theory)	Marks Weightage
I	**Fourier Series:** Introduction of Fourier series, Fourier series for discontinues functions, Fourier series for even and odd function, Half range sine and cosine series and Fourier transform.	**14**
II	**Laplace Transformations :** Introduction of Laplace Transform of elementary functions, Properties of Laplace transform ,Change of scale property, Shifting property, Laplace transform of the derivative, Inverse Laplace transform and its properties, Convolution theorem and applications of Laplace transformation to solve the ordinary differential equations.	**14**
III	**Second Order Linear Differential Equations with Variable Coefficients:** Methods one integral is known, Removal of first derivative, Changing of independent variable and variation of parameter, Solution by series method.	**14**
IV	**Linear & Non Linear Partial Differential Equations of First Order :** Formulation of partial differential equations, Solution of equation by direct integration, Lagrange's linear equation, Non linear partial differential equation and Charpit's method, Linear homogeneous and non-homogeneous partial differential equation of second and higher order with constant coefficients.	**14**
V	**Vector Calculus :** Differentiation of vectors, Scalar and vector point function, Geometrical meaning of gradient, Unit normal vector and directional derivative, Physical interpretation of divergence and curl, Line integral, Surface integral and volume integral, Green's Stroke's and Gauss divergence theorem.	**14**

Text Book/References Books/ Websites

1. D.C. Aggarwal ;Engg. Mathematics – II; S Chand Publication.
2. BS Grewal ;Higher Engineering Mathematics; Khanna Publication.
3. S.Arumungam ;Mathematics for Engineers; SCITECH Publications.
4. Erwin Kreyszig ;Advanced Engineering Mathematics; Wiley India.
5. D.G.Guffy ;Advance Engineering Mathematics; Jones & Bartlett.
6. S Sastri; Engineering Mathematics; P.H.I. Publication.
7. Peter V.O'Neil, Thomson Learning ;Advanced Engineering Mathematics; CENGAGE Learning Custom Publishing.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: **Bachelor of Technology** **Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total 100			Total
CET-1302	Transportation Engg.-I	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test - Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab work & Sessional - Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil

Pre-Requisite	**Nil**
Course Outcome	1. To study about tractive resistances & permanent way, principles of transportation, modes of transportation, their importance and limitations.
	2. Geometric design of station & yards, points & crossings, super elevation, equilibrium, cant and cant deficiency, various curves, layout details.
	3. To study about bridge site investigation and planning, collection of bridge design data type of road & railway bridges.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction, Tractive Resistances & Permanent Way:** Principles of transportation, Modes of transportation, Their importance and limitations, Route surveys and alignment, Railway track, Development and gauges, Hauling capacity and tractive effort, MONO and rapid transit rail (Metro). **Rails:** Types, Welding of rails, Wear and tear of rails, Rail creep. **Sleepers**: Types and comparison, Requirement of a good sleeper, Sleeper density. **Rail Fastenings**: Types, Fish plates, Fish bolts, Spikes, Bearing plates, Chain keys, Check and guard rails. **Ballast:** Requirement of good ballast, various materials used as ballast, quantity of ballast.	**14**
II	**Station & Yards; Points & Crossings & Signaling & Interlocking:** Formation, cross sections, super elevation, equilibrium, cant and cant deficiency, various Curves, speed on curves. Types, locations, general equipments, layouts, marshalling yards, Definition, layout details, types of signals in stations and yards, Principles of signaling and inter-locking.	**14**
III	**Bridge Site Investigation and Planning;** Loading standards &component parts, Selection of site, Alignment, Collection of bridge design data, Essential surveys, Scour, Depth of bridge foundation, Economical span, Clearance, Afflux. **Type of Road & Railway Bridges:** Design loads and forces, Impact factor, Indian loading standards for railways bridges and highway bridges, Bridge super structure and sub-structures, Abutments, Piers, Wing walls, Return walls, Approaches, Choice of super structure.	**14**
IV	**Bridge Foundations, Construction, Testing and Strengthening of Bridges** : Different types of foundation, Piles and wells, Sinking of wells, Coffer-dams, Details of construction underwater and above water, Sheet piles coffer dams, Girders, Equipments and plants, Inspection and data collection, Strengthening of bridges, Bridge failure.	**14**
V	**Tunnels:** Selection of route, Engineering surveys, Alignment, shape and size of tunnel, Tunnel approaches, Construction of tunnels in soft soil, Hard soil and rock, Different types of lining, Methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.	**14**

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Programme: **Bachelor of Technology** **Semester –III**

Text Book/References Books/ Websites

1. S.P. Bindra ; Principles and Practice of Bridge Engineering; Dhanpat Rai & Sons.
2. Ponnuswamy; Bridge Engineering; TMH Publication.
3. Arora & Saxena; Railway Engineering ; Dhanpat Rai & Sons.
4. Dr.S.C. Saxena, Railway; Bridges & Tunnels; Dhanpat Rai & Sons.
5. R. Srinivasan; Harbour, Docks & Tunnel Engineering; Charotar Publication.

Suggeted List of Laboratory Experiments :- (Expandable): Nil

Subject Code	Subject Title	Credit	Theory	Practical

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Programme: **Bachelor of Technology** **Semester –III**

CET-1303	**Strength of Materials**	**L**	**T**	**P**	**External (70)**	**Internal (30)**	**Total 100**	**External (35)**	**Internal (15)**	**Total (50)**
		3	**1**	**1**			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test - Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	**Nil**
Course Outcome	1. Study about the simple stress and strains: various types of stress and strains.
	2. To know about the principal stresses and strains, Mohr's circle of stresses, support reactions, shear force and bending moment.
	3. To give knowledge about the torsion of shafts & its applications.

Unit	Contents (Theory)	Marks Weightage
I	**Simple Stress and Strains**: Concept of elastic body, Stress and strain, Hook's law, Various types of stress and strains, elastic constants, Stresses in compound bars, Composite and tapering bars, Temperature stresses.	**14**
II	Principal stresses and strains, Mohr's circle of stresses, Combined bending and torsion, Theories of failure, Support reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and couple.	**14**
III	**Bending & Deflection:** Theory of simple bending, Concept of pure bending , Equation of bending, Neutral axis, Section-modulus, Determination of bending stresses in simply supported, Cantilever and overhanging beams subjected to point load and uniformly distributed loading, Bending & shear stress distribution across a section in beams, Deflection of beams, Double integration method, Conjugate beam method, Macaulay's method, area moment method.	**14**
IV	**Torsion of Shafts:** Concept of pure torsion, torsion equation, Determination of shear Stress and angle of twist of shafts of circular section, Hollow shafts, leaf spring, Spiral spring, pressure vessels, Stress due to internal pressure, Change in diameter and volume, Compound cylinders and shrink fittings.	**14**
V	**Columns and Struts:** Euler's buckling load for uniform section, Various end conditions, Slenderness ratio, stress in columns, Rankine formulae, Eccentric loading on columns.	**14**

Text Book/References Books/ Websites

1. Negi; Strength of Materials; TMH
2. Sadhu Singh; Strength of Materials, Khanna Publication
3. Rattan SS; Strength of Materials; TMH
4. Subramaniam; Strength of Materials; R; Oxford
5. National Building Code of India, Part-IV Code

Suggested List of Laboratory Experiments :- (Expandable):

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Programme: **Bachelor of Technology** **Semester –III**

I	The experimental work to tension, compression, bending, impact test on the RCC, steel ,mild steel ,cat iron ,timber etc.
2	To study the Universal Testing Machine (U.T.M.)
3	To Determine hardness of mild steel.
4	To perform torsion test on mild steel.
5	To determine impact strength test by Izod test).
6	To determine impact strength test by Charpy Test.
7	To determine Young's Modulus of elasticity of different material of beam simply supported at ends.
8	To perform shear test on matels.
9	To determine the stiffness of the spring and modulus of rigidity of the spring wire.
10	To study various types of strain gauges.

Subject Code	Subject Title	Credit			Theory			Practical		
CET-1304	**Building Design and Drawing**	**L**	**T**	**P**	**External**	**Internal (30)**	**Total 100**	**External (35)**	**Internal (15)**	**Total (50)**

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Programme: **Bachelor of Technology** **Semester –III**

		3	**1**	**1**	**(70)**		Min 40 (D Grade)			Min 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test - Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	**Nil**	
Course Outcome	1	Drawing of various elements of buildings like footing, door and windows, staircase, lintel and arches.
	2	Use of national building code for building planning, principles of planning and orientation.
	3	To demonstrate building services like water supply, electrification, ventilation, fire safety.

Unit	Contents (Theory)	Marks Weightage
I	**Drawing of Building Elements** : Drawing of various elements of buildings like various, Types of footing, Open foundation, Raft, Grillage, Pile and well foundation, Drawing of frames of Doors, Window, Various types of door, Window and ventilator, Lintels and arches, Stairs and staircase, Trusses, Flooring, Roofs etc.	**14**
II	**Building Planning** : Provisions of national building code, Building bye-laws, Open area, Set backs, FAR terminology, Principle of architectural composition (i.e. Unity, contrast, etc.), Principles of planning, Orientation.	**14**
III	**Building Services** : Introduction of building services like water supply and drainage, Electrification, Ventilation and lightening and staircases, Fire safety, Thermal insulation, Acoustics of buildings.	**14**
IV	**Design and Drawing of Building :** Design and preparation of detailed drawings of various Types of buildings like residential building, Institutional buildings and commercial buildings, Detailing of doors, Windows, Ventilators and staircases etc.	**14**
V	**Perspective Drawing :** Elements of perspective drawing involving simple problems, One point and two point perspectives, Energy efficient buildings.	**14**

Text Book/References Books/ Websites

1. Malik & Meo; Building Design and Drawing , Asian Publishers/Computech Publications Pvt Ltd.
2. Shah, Kale & Patki; Building Design and Drawing; TMH.
3. Gurucharan Singh & Jagdish Singh Building Planning, Design and Scheduling, Standard Publishers Distributors.

Suggested List of Laboratory Experiments :-

1 Sketches of various building components.
2 One drawing sheet of various types of foundation.
3 One drawing sheet of various building components containing doors, windows & ventilators.

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Programme: **Bachelor of Technology** **Semester –III**

4 One drawing sheet of Stairs case.
5 One drawing sheets each for services and interiors of buildings.
6 One drawing sheet containing detailed planning of one/two bed room residential building (common to all students).
7 One drawing sheet each of residential and institutional building (each student perform Different drawing).
8 Use of AutoCAD for preparation of drawings.

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External (70)	Internal (30)	Total 100	External (35)	Internal (15)	Total (50)
CET-1305	Rock Mechanics and Engineering	3	1	1			Min 40 (D Grade)			Min 20 (D Grade)

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Programme: **Bachelor of Technology** **Semester –III**

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test - Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	**Nil**	
Course Outcome	1	To study about crust and interior of earth, deposition of soil and classification of soils.
	2	To demonstrate fundamentals of mineralogy and elements of crystallography.
	3	To understand composition of earth's crust, geology of India.

Unit	Contents (Theory)	Marks Weightage
I	**Introduction and Physical Geology**: Objects and scope of geology, The crust and the interior of the earth, Origin and age of the earth, Sub-aerial and sub-terrain weathering, Denudation and deposition, Wind, river, Glacial and marine erosion, Volcanoes , Soil formation, Soil profile, Geological classification of soil and concept of earthquake plate-tectonics.	**14**
II	**Mineralogy and Crystallography**: Fundamentals of mineralogy, Study of common rock forming minerals, Ores and minerals of economic importance to civil engineering., Elements of crystallography and introduction to crystal systems.	**14**
III	**Petrology:** Composition of earth's crust, Study of igneous, Sedimentary and metamorphic rocks and their formation, Characteristics classification, Rocks of civil engineering Importance. **Geology of India:** Physical features of India, Brief geological history of India, Occurrence of important ores and minerals in India.	**14**
IV	**Structural Geology**: Structures related to rocks, Dip, Strike and outcrops, Classification and detailed studies of geological structures i.e. Folds, Faults, Joints, Unconformity and their importance in civil engineering.	**14**
V	**Applied Geology:** Introduction to applied geology and its use in civil engg., Properties of rocks, Selection of sites for roads, Bridges, Dams, Reservoirs and tunnels, Prevention of engineering structures from seismic shocks, Stability of hill sides, Water bearing strata, Artesian wells, Use of remote-sensing techniques in selection of above sites.	**14**

Text Book/References Books/ Websites

1. Prabin Singh; Engineering and General Geology; Katson Books.
2. Gulati ; Geotechnical Engineering; TMH.
3. P.K. Mukerjee ;A Text Book of Geology; World Publisher.
4. S.K. Garg ;A text book of physical and engineering geology; Khanna Publisher.

Suggested List of Laboratory Experiments :-

1 Identification of simple rock forming minerals and important ores.
2 Identification of rock.
3 Simple map exercises.
4 Field visit / geological excursion.

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: **Bachelor of Technology** **Semester –III**

5	To study the earth and interior of the earth.
6	To study about the sun and planets according to size, distance, description of satellite with the help of chart.
7	To study the land forms of the earth by land form models.
8	To study about ground water, glacier, sea water, rivers, denudation, wind eolian system with the help of chart.
9	To study the charts showing topography of the ocean floor, psunami, map of ocean current.

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (Nil)	External	Internal	Total (50)
BT-1306	C++ Programming	-	-	1	(Nil)	(Nil)	Nil	(35)	(15)	Min: 20 (D Grade)

Duration of Theory (Externals): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: **Bachelor of Technology** **Semester –III**

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test - Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	Students have basic knowledge of programming
Course Outcome	1.An understanding of the concepts of inheritance and polymorphism
	2. An understanding basic concepts of C++ programming
	3.An ability to incorporate exception handling in object-oriented programs

Unit	*Contents (Theory)*	Marks Weightage
I	**C++ Basics:** Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Strings, Structures, conditional statement, control structure, switch-case, break, go to statements. **OOPS :** Introduction to OOPS, differences Between OOP and Procedure Oriented Programming, Overview of OOP principles. **Function & Classes:** Scope of variables, Parameter passing, Default arguments, inline function, Recursive function, Dynamic memory allocation and reallocation, operators-new and delete, Preprocessor directives, **Classes:** Class Definition, Class Structure, Class Scope, object, Friends to a class, Static class members, Constructors and Destructors, Dynamic creation and destruction of objects, Data Abstraction. **Inheritance:** Inheritance, Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class member. **Polymorphism:** Function overloading, Operator Overloading , Virtual Function Polymorphism: Static and Dynamic binding, Base and Derived class virtual functions, Pure virtual functions, Abstract classes, C++ Exception Handling and File Handling, Comparison of C++ with C, Java and C#.	**50**

Text Book/References Books/Websites

1. E. Balaguruswamy;Object Oriented programming with C++; TMH, 2001
2. Yashwant Kanitkar; Let us C++
3. Radha Ganesan;Object Oriented Programming with C++"; Scitech Publication PVT.LTD. Chennai
4. Padam Gulwani & Anshuman Sharma;Elementary Concepts of Computer Design and Hardware

Suggested List of Laboratory Experiments :- (Expandable):

1. Program to print any Message
2. Program for Conditional Statements, Looping Statements and Switch Case
3. Program to implement Arrays, Strings and Pointers
4. Program to implement Functions and Dynamic Memory Allocation
5. Program to implement Class and Objects

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Programme: **Bachelor of Technology** **Semester –III**

6. Program to implement Friend Functions and Constructors
7. Program for Inheritance
8. Program for Polymorphism
9. Program for File Handling
10. Program for Exception Handling

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total 100			Total (50)
BT-1307	Professional Skills	-	-	1	External (Nil)	Internal (Nil)	Nil	External (Nil)	Internal (50)	Min: 20 (D Grade)

Duration of Theory (Externals): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: **Bachelor of Technology** **Semester –III**

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test - Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab work & Sessional - Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50

Pre-Requisite	**Nil**	
Course Outcome	1	Team work and leadership qualities of a leader.
	2	Task planning and its execution.
	3	Business communication and its necessary skills.

Unit	Contents (Theory)	Marks Weightage
I	**Social Skills:** Society, Social structure, Develop sympathy and empathy. **SWOT Analysis**: – Concept, How to make use of SWOT.	**50**
II	**Inter personal Relation:** Sources of conflict, Resolution of conflict; Ways to enhance interpersonal relations.	
III	**Quantitative Aptitude:** Percentages/Profit & Loss, Time and work, Simple and compound Interest, Series and progression.	
IV	**Reasoning :** Puzzles and seating arrangement, Data sufficiency, Coding-decoding, Blood relation, Order and ranking, Alpha numeric symbol series, Logical reasoning:	
V	**English**: Free quizzes related to synonyms, Antonyms, One word substitution, Idioms and phrases, Spelling correction, Fill in the blanks and common errors in english.	

Text Book/References Books/ Websites : Nil

Suggested List of Laboratory Experiments :- (Expandable): Nil

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total Nil	External	Internal	Total (50)
CET-1308	**AutoCAD-I**	-	-	1	**(Nil)**	**(Nil)**	**Nil**	**(35)**	**(15)**	Min: 20 (D Grade)

Duration of Theory (Externals): Nil

PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: **Bachelor of Technology** **Semester –III**

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test - Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05

Pre-Requisite	**Nil**	
Course Outcome	1	To give knowledge about the Auto Cad designing Software.
	2	To give knowledge about how to draw Plan of any structures.
	3	To study of all command uses in drawing.

Unit	Contents (Theory)	Marks Weightage
I	**Students Have to Understand the Working of AutoCAD:** Introduction to computer aided drafting software for 2d and 3d modeling, Benefit, Software's basic commands of drafting entities like line, Polyline , Scale, Trim, Extend, Circle, Polygon, Rectangle editing commands like move, Rotate, Mirror, Array**.** . Practicing commands under draw and dimension menu. . Practicing commands under modify menu. . Practicing commands under tool menu. . Practicing commands under format menu. . Practicing commands under express menu.	**50**

Text Book/References Books/ Websites :- Nil

Suggested List of Laboratory Experiments :- (Expandable): Nil

Department of Biochemistry, PCMS & RC, Bhopal

MD Program Outcomes (POs)

At the end of the MD training programme in Biochemistry, the post graduate student should have acquired competencies in the following areas, as detailed below.

PO1. Acquisition of knowledge - The student should be able to explain clearly concepts and principles of biochemistry and cell biology, including correlations of these with cellular and molecular processes involved in health and disease.

PO2. Teaching and training - The student should be able to effectively teach undergraduate students in medicine and allied health science courses **and** become competent **as** health care professionals and able to contribute to training of postgraduate students.

PO3. The student should be able to analyze, interpret, and release routine and special lab investigations.

PO4. The student should be able ensure total quality management effectively and be capable to troubleshoot the errors and providing a reliable support service.

PO5. The student should be able to provide clinicians with consultation services for diagnostic tests in biochemistry and in interpretation of laboratory results.

PO6. The student should be able to set up/supervise/manage a diagnostic laboratory in Biochemistry in any hospital,

PO7. Research –

- The student should be able to carry out a research project from planning to publication
- The student should be able to pursue academic interests and demonstrate himself as life-long learner to gain more expertise.

PO8. The student be able to guide undergraduates in short term projects and eventually be capable of guiding postgraduates in their thesis work.

Course Articulation Matrix: (Mapping of COs with POs)

Course Outcome	Correlation with program outcome							
	PO-1	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08
CO1	2	2	3	3	2	3	3	3
CO2	2	3	2	3	2	2	3	3
CO3	2	3	3	3	3	3	3	2
CO4	3	3	3	1	3	3	2	1
CO5	3	2	1	3	3	3	2	1
CO6	3	1	2	3	3	3	3	2
CO7	2	3	3	2	3	2	2	3
CO8	2	2	3	3	2	1	3	3

Name of Course:-MD Course Code- **MD-009,010,011,012** Year/Semester- **I**

Session-2019-20

Scheme of Course:- MD

Course Objective:-

Course Outcomes: At the end of the course the student, after undergoing the training, should be able to:

1. Explain the **Biochemical** concepts related to **medical conditions** in clinical (medical)laboratory
2. **Describe** the metabolic role of nutrients and its metabolitesin physiological **as well as** pathological processes.
3. **Describe the metabolic role of Micro & Macro nutrients in major organs and tissues in physiological as well as pathological conditions.**
4. Explain**and clinically correlate** the metabolism of carbohydrates, proteins, lipidsand lipoproteins.
5. **Clinically** correlate metabolic processes and **suggest appropriate investigations for monitoring metabolite concentration in specific diseases.**
6. **Perform, monitor and interpret laboratory investigation.**
7. **Help the clinician in clinical correlation.**
8. **Attain proficient in Quality assurance of laboratory.**

Assessment Plan :-(For Reference & Sample) **Criteria**	**Description**	**Maximum Marks**
Internal Assessment (Summative)	Sessional Exam I	10
Sessional Exam II		10
Attendance		75
Assignments		10
Group Work		10
End Term Exam (Summative)	End Term Exam	100
Total		100
Attendance (Formative)		A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.
Make up Assignments (Formative)		Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)		There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.
➢ Seminar ➢ Journal Club ➢ Group Discussion ➢ Project		MD Students regularly and monthly involved in these activities & assessed periodically & Constructive feedback given immediately.

PEOPLE'S UNIVERSITY, BHOPAL

SYLLABUS FOR M.D. BIOCHEMISTRY

Goal:

The broad goal of teaching & training of postgraduate students in Medical Biochemistry is to make them understand the scientific basics of the life processes at the molecular level and to orient them towards the applications of the knowledge acquired in solving clinical problems. At the end of his/her training, the student shall be able to take up a career in Teaching Institution or in diagnostic laboratory or in Research.

OBJECTIVES:

A) KNOWLEDGE:

At the end of the course the students shall be able to:

1) Explain the structure, function & inter-relationships of biomolecules & their deviation from normal & their consequences.
2) Summarize the fundamental aspects of enzymology & alteration on enzymatic activity with reference to clinical applications.
3) Explain the molecular & biochemical basis of inherited disorders with their associated sequel.
4) Explain the mechanisms involved in maintenance of body fluids & pH homeostasis.
5) Integrate the various aspects of metabolism & their regulatory pathways.
6) Outline the molecular mechanisms of gene expression & regulation, the principles of genetic engineering & their application in medicine.
7) Explain the molecular concept of body defenses & their applications in medicine
8) Explain the biochemical basis of environmental health hazards, biochemical basis of cancer & Carcinogenesis.
9) Familiarize with the principles of various conventional & specialized laboratory investigations & instrumentation analysis and interpretation of a given data.
10) Effectively organize & supervise diagnostic laboratory to ensure quality control/Assurances.

B) SKILLLS:

At the end of the course the students shall be able to:

1) Make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening & diagnosis.
2) Analyze & interpret investigative data.
3) Demonstrate the skills of solving scientific & clinical problems and decision making.
4) Develop skills as a self-directed learner; recognize continuing educational needs, select & use appropriate learning resources.
5) Demonstrate competence in basic concept of research methodology & be able to critically analyze relevant published research literature.

C) INTEGRATION:

The knowledge acquired in Biochemistry shall help the students to integrate molecular event with structure & function of the human body in health & disease.

1) Eligibility – Recognized degree of M.B.B.S. or its equivalent recognized qualification.

2) Duration of course shall be of 3 (Three) years from the date of admission.

PERIOD OF TRAINING:

Duration of the course shall be of three years (six academic terms) from the date of admission.

1) The students will attend all U.G. lectures and practicals and will work in central clinical laboratory of the hospital and do all the routine, emergency and special investigations.

2) The students will be posted in the Dept. of Pathology & Microbiology for a period of one month each to learn hematology, Blood grouping & serology etc.

3) The students will be posted in the Dept. of Medicine to study the Clinical cases for a period of 3 months. However, they will attend P.G. activities and duties in in the Department of Biochemistry & Central Clinical Laboratory of the Hospital.

4) Students will participate in P.G. activities; viz, Seminars, Group discussion, Journal club etc. and will attend P.G. Lecture

5) Students should learn basic knowledge of computers and medical statistics.

6) Training in Medical audit, management, health economics, health information system, basics of medical statistics & bioinformatics, exposure to human behavioral studies & medical ethics shall be imparted to the P.G. students.

7) They will be required to participate in the teaching & training programs of U.G. students.

8) They will be granted a term provided they will put 80% attendance during the academic term.

People's University
MD Biochemistry
Paper Code: MD-009
(Applied and Clinical Biochemistry)

Paper Code	Paper	Paper Name	Duration	Maximum Marks
MD-009	Biochemistry Paper-I	Applied and Clinical Biochemistry	3 hrs	100

PAPER – I
Applied and Clinical Biochemistry
Syllabus

- History & scope of Biochemistry
- Biochemistry of Cell
- Chemistry & biological importance of carbohydrates, proteins & amino acids, lipids, nucleic acids
- Chemistry of blood & hemoglobin, plasma proteins, Blood coagulation
- Environmental Biochemistry
- Chemistry, composition & functions of biological fluids
- Urine formation, excretion & urine analysis.
- Composition, chemistry & functions of specialized tissues like muscle, bone, nerve, connective tissue, & brain adipose tissue.
- Acid base balance & imbalance
- Biochemistry of Diabetes mellitus, Atherosclerosis, Fatty liver, and obesity
- Organ function tests : Liver function tests, Kidney function test, Thyroid function tests, Adrenal function tests, Pancreatic function tests, Gastric function tests
- Radioisotopes & their clinical applications
- Biochemistry of aging.
- Neurochemistry in Health & Disease.
- Biochemical changes in pregnancy & lactation
- Water & electrolytes balance & imbalance.
- Total Quality Management of Laboratories: Internal Quality control, External Quality control, Accreditation of laboratories
- Basics of Medical statistics
- Inborn errors of metabolism
- Biotrasformations of Xenobiotics
- Basic concepts of Biochemical Defense Mechanisms

People's University
MD Biochemistry

Paper Code: MD-010
(Bioenergetics, Enzymes, Metabolism)

Paper Code	Paper	Paper Name	Duration	Maximum Marks
MD-010	Biochemistry Paper-II	Bioenergetics, Enzymes, Metabolism	3 hrs	100

PAPER – II
Bioenergetics, Enzymes, Metabolism
Syllabus

- Bioenergetics & biological oxidation- General concept of oxidation & reduction. Electron transport Chain (ETC)- functioning of ETC & inhibitors of ETC, Oxidative phosphorylation, Uncouplers and theories of Biological oxidation & oxidative phosphorylation.

- Enzymes & coenzymes –chemistry, nomenclature properties & mode of action of enzymes, Enzyme kinetics, factors affecting enzyme activity, enzyme inhibitions, applications of enzymes & isoenzymes.

- Metabolism :
  i. Digestion & absorption from gastrointestinal tract.
  ii. Intermediary metabolism, metabolism of Carbohydrates, Lipids, Proteins and Amino acids, Nucleic acids, Hemoglobin
  iii. Metabolic interrelationships & regulatory mechanisms
  iv. Metabolic changes during starvation
  v. Energy metabolism- Calorimetry, BMR- its determination & factors affecting it, SDA of food.

People's University
MD Biochemistry
Paper Code: MD-011
(Nutrition, Vitamins, Minerals, Hormones, Molecular Biology, Immunology, Cancer)

Paper Code	Paper	Paper Name	Duration	Maximum Marks
MD-010	Biochemistry Paper-III	Nutrition, Vitamins, Minerals, Hormones, Molecular Biology, Immunology, Cancer	3 hrs	100

PAPER – III
Nutrition, Vitamins, Minerals, Hormones, Molecular Biology, Immunology, Cancer
Syllabus

- Principles of Nutrition – Balanced diet & its planning, Nutritive importance of various food sources, Calorific value of food , toxins & additives , Obesity, Protein Energy Malnutrition (PEM)- Kwashiorkor & Marasmus .
- Diet in management of chronic diseases viz, Diabetes mellitus, Coronary artery disease, Renal disorders, Cancer, Hypertension, Anemia, Rickets & Osteomalacia.
- Diet for overweight person, pregnant woman and during lactation
- Vitamins- chemistry, biological importance, deficiency manifestations & recommended daily allowance.
- Macro & micro –elements & their role in health & disease
- Hormones : Communication among cells & tissues, Hormone- General mechanism of action of hormones, chemistry, functions, synthesis of steroid hormones, polypeptide hormones, & thyroid hormones. Chemistry & functions of hormones of pancreas and parathyroid. Local hormones. Clinical disorders of hormones, Hormone receptors.
- Central dogma, genetic code, protein biosynthesis & its regulation.
- DNA: structure, functions, replications, Mutation & repair of DNA, Sequencing of nucleotides in DNA, Mitochondrial DNA, and DNA recombination.
- RNA: composition, types, structure & functions.
- Role of Nucleic acids in diagnosis of Molecular diseases & infectious diseases
- Mitochondrial DNA & diseases.
- Human Genome Project.
- Genes & chromosomes, Gene mapping, Chromosome walking etc.
- Gene expression & gene amplification & gene regulation, Oncogenes & biochemistry of cancer.
- Genetic engineering: Recombinant DNA technology & its applications. Restriction endonucleases, Plasmids, Cosmids, Gene cloning, Gene libraries.
- Basics techniques in genetic engineering:
    a. Isolation & purification of DNA, Methods of DNA assay.
    b. Blotting techniques – Southern, Northern & Western blotting.
    c. Polymerase chain reaction & its applications.

d. Ligase chain reaction & its applications.

- Immunochemistry – The Immune system, Immunoglobins, antigen – antibody mediated immunity, mononuclear phagocytes –macrophages, elements of clinical immunity.
- Tumor markers & growth factors

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MD Biochemistry

Paper Code: MD-012

(Recent advances in Biochemistry & Biochemical Methodologies)

aper Code	Paper	Paper Name	Duration	Maximum Marks
MD-012	Biochemistry Paper-VI	Recent advances in Biochemistry & Biochemical Methodologies	3 hrs	100

PAPER – IV

Recent advances in Biochemistry & Biochemical Methodologies

Syllabus

- Gene therapy, Nucleic acid hybridization, and DNA probes, Microarray of gene probes.
- Genomics and Proteomics
- Medical Bioinformatics
- Lipid peroxidation, free radicals & antioxidants, Nitric oxide formation & its metabolism & its role in Medicine.
- Biochemistry of AIDS
- Genetic control of Immunity
- Research Methodology & Medical ethics.
- Principle, working & applications of-a) Colorimetry b)Spectrophotometry c)Flame photometry d) Flurometry e)Atomic absorption spectroscopy g) ultra centrifugation
- Principle, types & applications of : a)Electrophoresis b)chromatography
- Autoanalyzers, Blood gas analyzers
- Automation in clinical chemistry
- pH, electrodes & methods of pH determination.
- Basics of Mass spectroscopy, Nuclear Magnetic Resonance, chemiluminescence and Electron microscopy

SYLLABUS FOR PRACTICALS :

1) All undergraduate practicals and routine emergency and special investigations carried out in central clinical laboratory of the hospital, which are useful for diagnosis and prognosis of the disease.
2) Total Quality Management of Laboratory: Specimen collection, handling & storage of sample, Methods of standardization & calibration, Methods of quality control & assessment.
3) Fractionation & Identification of, a) Amino acids b) Sugar c) Proteins d) Lipoproteins by i) Thin Layer Chromatography ii) Paper chromatography (circular, Unidimensional & two dimentional iii) Gel electrophoresis- agarose, starch, & Polyacrylamide Gel Electrophoresis iv) paper electrophoresis & cellulose acetate paper electrophoresis .
4) a) Estimation of total activity of following enzymes: LDH & seperation of its isoenzymes by Polyacryamide gel electrophoresis, Cellulose acetate electrophoresis & quantitation by densitometry, AST (GOT),ALT (GPT),Alkaline phosphatase, Acid phosphatase, Amylase, Creatine kinase its Isoenzymes
b) Enzyme kinetics and Determination of Km value and effect of pH substrate concentration & temperature on Enzyme activity
c) Endocrinology: Estimation of Hormones
5) Isolation of DNA and PCR technique
6) Estimation of serum lipid profile
7) Estimation of Fe & Total Iron Binding capacity & ferritin
8) Estimation of Glycosylated Hb
9) Body fluid analysis – Urine, CSF, Ascitic fluid, Pleural fluid
10) Estimation of Na, K & Lithium by Flame photometer

Dissertation:

The dissertation is compulsory for candidates registered for P.G. degree & should include candidates own work under a supervisor, qualified for the purpose & recognized as a P.G. teacher by the University. The subject of dissertation along with synopsis (about 200 words) signed by P.G. teacher, H.O.D. & Head of the Institution will be submitted to the University. Ethics Committee of the Institution must approve the topic of dissertation. Completed dissertation will be submitted to the University in the 5th term, that is, 6 month before the date of final examination.

SCHEME OF EXAMINATION

Scheme of MD examination (final) & internal assessment, maximum & minimum marks and log book has been attached.

Internal assessment

Periodic internal assessment examination - terminal examination at the end of each year (the last will be preliminary examination). Internal assessment shall be based on lectures, Seminars, journal club, Group Discussions, Participation in laboratory and experimental work and involvement in research studies in concerned speciality & exposures to the applied aspects of the subject relevant to clinical specialties.

Personal attributes - Sincerity, Punctuality, Diligence and Performance, academic ability, inter personal skills etc.

Log Book

PG students shall maintain a record (Log Book) of the work carried out by them & the training programs undergoes during the period of training. Record book shall be checked & assessed by the faculty members imparting the training.

PATTERN OF FINAL THEORY & PRACTICAL EXAMINATION

. DISSERTATION :

issertation should be submitted by each candidate to the University in the 5th term, that is, 6 month efore the date of final examination.

. THEORY EXAMINATION :

here shall be four theory papers.
otal marks 100 x 4 = 400

aper-I : MD-009 (Applied and Clinical Biochemistry)
aper-II : MD-010 (Bioenergetics, Enzymes, Metabolism)
aper-III : MD-011 (Nutrition, Vitamins, Minerals, Hormones, Molecular Biology, Immunology, Cancer)
aper-IV : MD-012 (Recent advances in Biochemistry & Biochemical Methodologies)

BLUE PRINT OF QUESTION PAPER

attern of Theory Papers 100 mark each.
uration of Theory examination 03 hours each.

Subject	Component with marks	
Biochemistry	Section A : Short answer Question (SAQ) – Six (10 mark each)	60
	Section B : Long answer Question (LAQ) – Two (20 mark each)	40

(Section A & B should broadly cover whole syllabus of that paper.)

3. PRACTICAL EXAMINATION:

Total marks 100 x 4 = 400

Subject	Component with marks	
Biochemistry	1.Short Experiments – Three (50 mark each)	150
	2.Long Experiment - One	150
	3. Grand Viva including Pedagogy	100

riteria for passing:

candidate shall secure not less than 50% marks in each head that shall include

.Theory 2.Practical & Viva voce examination.

upplementary examination: Within six month of last university examination.

evaluation & retotalling of Marks

)nly retotalling of marks as per university rules & prescribed fees.

Books recommended:

1) Biochemistry Ed Lubert Stryer . W.H. Freeman & company, New York.
2) Principles of Biochemistry. Ed. Lehninger , Nelson & Cox . CBS publishers & distributers.
3) Harpers Biochemistry Ed. R.K. Murray, D.K. Granner, P.A. Mayes & V.W.Rodwell. Appleton & Lange, Stanford, Conneticut.
4) Textbook of Biochemistry with clinical correlations. Ed. Thomas M. Devlin. Wiley Liss Publishers.
5) Genes VI Ed. Benjamin Lewin . Oxford University press.
6) Tietz Textbook of Clinical chemistry, Ed. Burtis & Ashwood W.B. Saunders Company.
7) Principles & techniques of practical Biochemistry Ed. Keith Wilson & John Walker Cambridge University press.
8) Biochemistry Ed. Donald Voet & Judith G. Voet John Wiley & Sons, Inc.
9) Molecular cloning –A laboratory Manual .J. Sambrook , E.F. Fritsch & T.Maniatis Cold Spring Harbor Laboratory Press.
10)Molecular cell Biology , H.Lodish,A. Berk, S.L. Zipursky, P. Matsudaira ,D. Baltimore , J.Darnell.
11) Bio-technology 1st edition. U. Satyanarayan. Books & Allied Publisher (p) Ltd.Kolkatta

Text Books:-			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
DM Vasudevan	Textbook of Biochemistry for Medical students	Latest	Jaypee Brothers Medical Publishers
	Lippincotts' Illustrated reviews – Biochemistry	Latest	
S.K.Gupta.	Biochemistry forMBBS	Latest	Avichal Publishing Company
Pankaja Naik.	Biochemistry	Latest	Jaypee Brothers Medical Publishers
Dinesh Puri.	Textbook of Medical Biochemistry	Latest	Elsevier Publication , India
Namrata Chhabra.	Case oriented approach towards Biochemistry	Latest	Jaypee Brothers Medical Publishers
Divya shatty D'sza, Sowbhagya lakhsmi	An easy guide to Practical Biochemistry	Latest	
Varley Horold	Practical Clinical Biochemistry	Latest	
Kaplan, Lawrence	Clinical Biochemistry	Latest	
Nelson David. L.	Lehninger Principle of Biochemistry	Latest	
Mahajan B.K.	Methods in Biostatistics for Medical Student and research work.	Latest	
David Beakar	Harper's illustrated Biochemistry	Latest	

Department of Biochemistry, PCMS & RC, Bhopal

MBBS Program Outcomes (POs)

At the end of MBBS program, the medical student should be able to:

- **PO 1**: Have a solid foundation of the structures and functions of different organ systems in the human body to develop a sound understanding about normal structure and functions, and is able to link diseases and medical conditions to such basic aspects.
- **PO 2**: Develop ability to identify any deviations from normal in terms of functional as well as structural deviations which form the basis of different diseases. To understand such deviations in details has clear understanding on the methods and investigations to be used for detecting them
- **PO 3**: To have a clear understanding on therapeutic options which can be employed for treating different disease conditions.
- **PO4:** Diagnose and manage common health problems of the individual and the community, commensurate with his/her position as a member of the health team at the primary,secondary or tertiary levels, using his/her clinical skills based on history, physicalexamination and relevant investigations.
- **PO 5**:Able to understand and investigate causes of deaths which are unnatural, including involvement of any foul play
- **PO 6**: Practice preventive, promotive, curative and rehabilitative medicine in respect to thecommonly encountered health problems.
- **PO 7**: Appreciate rationale for different therapeutic modalities, be familiar with theadministration of the "essential drugs" and their common side effects.
- **PO 8**: Appreciate the socio-psychological, cultural, economic and environmental factorsaffecting health and develop humane attitude towards the patients in discharging one'sprofessional responsibilities.
- **PO 9**: Becomes well acquainted with various National Health Programs, and the ways in which they are beingimplemented.
- **PO10**:Demonstrate communication skills, both verbal and written to establish effectivecommunication with the clients (patients, relatives, and general public), health teampartners, and scientific community.
- **PO 11**:Develop attitude for self-learning and acquire necessary skills including the use ofappropriate technologies, for pursuing self-directed learning for a life time.
- **PO 12**:Possess ethical and compassionate approach towards human beings while they are suffering from ailments or otherwise, assist them overcoming such distresses protecting them from any kind of exploitation.
- **PO 13**: Understands the health problems of communities and works to develop strategies and interventions to address them.

Course Articulation Matrix: (Mapping of COs with POs)

se ome	Correlation with program outcome												
	PO-1	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PO-12	PO-13
	1	1	2	1	3	1	2	1	2	1	3	3	3
	2	2	1	3	2	3	2	3	3	3	3	3	3
	3	2	3	3	3	3	2	3	3	3	3	3	3
	1	1	3	3	1	3	2	1	3	1	1	3	3
	3	3	3	3	3	3	1	1	3	3	3	3	3

Name of Course:-MBBS Course Code- **BS-1103** Year/Semester- **I**

Session-2019-20

Scheme of Course:- MBBS

Course Objective:-

Course Outcomes: At the end of the course the student, after undergoing the training, should be able to:

1. Explain the **Biochemical**concepts related to **medical conditions** in clinical (medical)laboratory
2. **Describe** the metabolic role of nutrients and its metabolitesin physiological **as well as** pathologicalprocesses.
3. **Describe the metabolic role of played by major organs and tissues in physiological as well as pathological conditions.**
4. Explain**and clinically correlate** the metabolism of carbohydrates, proteins, lipidsand lipoproteins.
5. **Clinically** correlate metabolic processes and **suggest appropriate investigations for monitoring analyte concentration in specific diseases.**

Assessment Plan :-(For Reference & Sample) **Criteria**	**Description**	**Maximum Marks**
Internal Assessment (Summative)	Sessional Exam I	50
Sessional Exam II		50
Attendance		75
Assignments		10
Group Work		10
End Term Exam (Summative)	End Term Exam	100
Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	
➢ Seminar ➢ Role-play ➢ Projects	MBBS Student regularly are involved in these activities & assessed accordingly.	

Paper Code	Name of Paper	Duration	Paper	Marks
BS-1103	Biochemistry	03 Hours	First[I]	Max-100 Min-50

Goal

The broad goal of the biochemistry curriculum is to provide a comprehensive, scientific knowledge of the structure and development of the human body in order to understand the biochemical basis of disease presentations and patient management.

PAPER-I (MAX 100 MARKS)

CELL AND ORGANELLES, CELL MEMBRANE, TRANSPORT ACROSS CELL MEMBRANES (BI1.1)
Core: Prerequisite: Concept of prokaryotic and eukaryotic cell, Cell organelles – Structure, Biochemical functions, Marker enzymes.

Cell Membrane □ Fluid mosaic model, composition, Fluidity of membrane Transport across cell membranes with examples. Passive transport – Diffusion and facilitated transport (ion channels) Active transport – Primary and Secondary. Endocytosis and Exocytosis Aquaporins ABC family of transporters. **Non core:** Cytoskeleton – Structure and functions of microtubules, actin filaments, intermediate filaments Inter cellular communication, Separation of cell organelles.

EXTRACELLULAR MATRIX: Core: Composition of ECM–Proteins(Composition and functions of Collagen, elastin, fibrillin, fibronectin, laminin) and Proteoglycans. Involvement of ECM components in health and disease. Eg. Osteogenesis Imperfecta, Ehler□Danlos syndrome etc. **Non core: Bone tissue–** Concept of Bone turn over, factors affecting bone turnover, Peakbone mass, List of markers of bone formation and bone resorption.

ENZYMES□ Definition, General properties, IUBMB Classification. Coenzymes and Cofactors, Mechanism of Enzyme action □ Concept of activation energy, transition state, binding energy, active site; Substrate binding to active site □ Koshlands Induced fit theory. Factors affecting enzyme activity- Effect of substrate concentration Michaelis □Menton theory, Km value, Vmax and its significance (derivation not required). Enzyme specificity, Enzyme inhibition □ Competitive and Non□competitive inhibition with examples of clinical importance Suicide inhibition. Enzymes as toxins – Eg. Snake venom phospholipase

Enzyme regulation by□ Short term (Covalent modification, Zymogen activation, Allosteric regulation, Feedback regulation) and longterm regulation (Induction and repression) Clinical Enzymology–Concept of plasma functional and non□functional enzymes Diagnostic Importance of enzymes – LDH, CK, AST, ALT, ALP, GGT, Amylase, Lipase, G6PD, Cholinesterase, ACP,5'nucleotidase Isoenzymes–Definition, Diagnostic Importance of isoenzymes with examples. Enzymes as Therapeutic agents Enzymes used in diagnostic assays Ribozymes . **Non core:** Mechanisms of enzyme catalysis (List)

CARBOHYDRATES CHEMISTRY: Definition, Biomedical importance Classification with examples Monosaccharide derivatives–Uronic acids, aminosugars, Glycosides, Sorbitol, Mannitol and their Clinical significance. Disaccharides, oligosaccharides □composition, importance Polysaccharides– Homopolysaccharides–Composition and Importance of starch, glycogen, Dextran, Cellulose andInulin. Heteropolysaccharides–Mucopolysaccharides (Composition and function) Concept of glycation and glycosylation Importance of Glycoproteins. **Non core:** Sialic acid – importance Blood group substances

CARBOHYDRATE METABOLISM:
Core: Digestion and absorption Mechanism of absorption Lactose intolerance.Insulin dependent and Insulin independent uptake of glucose by tissues PATHWAYS–Significance, Site, reactions, keysteps, energetics, regulation, inhibitors and associated disorders of□

- Glycolysis, Rapaport Leubering cycle and its significance
- Citric acid cycle, Amphibolic role, Anapleroticreactions
- Gluconeogenesis, Cori'scycle

Glycogenesis, Glycogenolysis, Glycogen storage disorders Significance of HMP shunt pathway and uronic acid pathway Glucose□6□Phosphate dehydrogenase deficiency Galactosemia, Essential Fructosuria, Hereditary fructose intolerance Regulation of blood glucose levels in well fed condition and fasting/starvation.

Non core: Galactose and Fructose metabolism, Details of Pyruvate dehydrogenase (PDH)reaction Essential pentosuria.

LIPIDS CHEMISTRY: Core: Definition, Modified Bloor's classification with examples. Biomedical importance of lipids. Fatty acids – Definition, examples and importance of Essential fatty acids, Mono and Polyunsaturated fatty acids,n3 and n6 fatty acids, Trans – fatty acids. Triacylglycerol – composition and importance Phospholipids – Types, functions with clinical importance Respiratory distress syndrome.

Glycolipids – Types and importance

Cholesterol – structure and biological importance Lipoproteins – Types and functions

Amphipathic lipids – Definition, examples and importance, Liposomes

Non core: Fatty acids–nomenclature and different types of classification Synthesis of lung surfactant

LIPID METABOLISM: Digestion and Absorption, Steatorrhea, Biosynthesis and breakdown of triacylglycerol.

PATHWAYS–Significance,Site,reactions,keysteps,energetics,regulation,and associated disorders of Beta oxidation, Ketogenesis, ketolysis, Cholesterol biosynthesis upto mevalonate. Other types of Oxidation of fatty acids and associated disorders. Lipoprotein metabolism Structure, Composition, Types,Functions, metabolism of Chylomicrons, VLDL, LDL,HDL. Formation and functions of bile acids and bile salts Fatty liver and lipotropic factors Hyperlipoproteinemias. Biochemical basis of use of hypolipidemic drugs Prostaglandins–types and biomedical importance. **Non core:** Fatty acid synthase multienzyme complex Outline of Fatty acid biosynthesis, Lipid Storage Disorders

METABOLISM AND HOMEOSTASIS: Core: Metabolic processes taking place in specific organs in the body in fed, fasting and exercise states. Metabolic changes during starvation. Adipose tissue–Hormones secreted from adipose tissue(adipokines–leptin, adiponectin) their functions and role in hunger and satiety.

Diabetes mellitus–types, metabolic changes, complications. Guidelines for diagnosis of Diabetes mellitus. Artificial sweeteners – list, use, metabolic effects (briefly) and concerns(to be discussed with in context of their use in Diabetes Mellitus).Lipid profile, Dyslipidemia

BIOLOGICAL OXIDATION: Prerequisite:Bioenergetics–Laws of thermodynamics, Free energy, Exergonic and endergonic reactions, Chemical Coupling Redox pair, Redox potential. High Energy Compounds–Definition, Classification, biological significance. Transport of reducing equivalents across mitochondria.

Electron Transport Chain–Organization, components, flow of electrons. Oxidative Phosphorylation – Sites, mechanism (Chemiosmotic theory). Binding change mechanism of ATP synthesis by ATP synthase. Inhibitors of Electron Transport Chain and oxidative phosphorylation. Uncouplers and their significance. Brown adipose tissue metabolism.

Non core: ATP – ADP cycle. Structure and organization of AT synthase complex. Mitochondrial myopathies

VITAMINS: Core: Prerequisite: Definition, difference between water and fat soluble vitamins- RDA, Sources, Metabolism, Biochemical functions, Deficiency, manifestations, Hypervitaminoses of Fat soluble vitamins (A,D,E,K).Water soluble vitamins – Vitamin C, Folic acid, Vitamin B12, Thiamine, Riboflavin, Niacin, Pyridoxine, Biotin. Pantothenicacid Antivitamins. **Non core:** Vitamers, Lipoic acid

MINERALS: Core: Major elements and trace elements- Sources, RDA, absorption and transport, Homeostasis, Functions, Biological reference range, disorders associated with – Calcium, phosphorus, Iron Functions and disorders associated with – Copper, Zinc, Selenium, Fluoride, Iodine, Magnesium, Molybdenum.

NUTRITION : Core: Energy content of food items, BMR–Definition, Normal values, Factors affecting and biomedical importance SDA – Definition and significance (Thermogenic effect of food)

Nitrogen balance, Balanced diet – definition, composition, Dietary fibers – definition, examples, importance Glycemicindex–definition, calculation, importance. Nutritional importance of Carbohydrates, Lipids, Proteins, Vitamins and minerals, commonly used food items including fruits and vegetables.Nutritional indices Calculation of calorie requirement. Dietary advice for optimal health in childhood and adults, special conditions like diabetes mellitus , coronary artery disease, pregnancy. Types, causes and effects of Protein energy malnutrition.

Obesity–Definition, BMI, types, causes, role of GI peptides and adipokinesin obesity, associated health risks (eg., metabolic syndrome)

ACID BASE BALANCE: Core: Prerequisite: Concept of Acids, Bases and buffers, HH Equation and its application Regulation of pH of blood by buffers, respiratory and renal mechanisms Anion gap and its significance. Acidosis and alkalosis (metabolic and respiratory)–causes, compensatory mechanisms and lab findings

WATER AND ELECTROLYTE BALANCE: Core: Distribution of water and electrolytes in ICF and ECF Osmolality of ECF. Regulation of water and electrolyte balance. Disorders of electrolyte imbalance–causes and clinical features of Hyperkalemia, Hypokalemia, Hypernatremia, Hyponatremia. Dehydration

Recommended books

Text Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
DM Vasudevan	Textbook of Biochemistry for Medical students	Latest	Jaypee Brothers Medical Publishers
	Lippincotts' Illustrated reviews – Biochemistry	Latest	
S.K.Gupta.	Biochemistry fo rMBBS	Latest	Avichal Publishing Company
Pankaja Naik.	Biochemistry	Latest	Jaypee Brothers Medical Publishers
Dinesh Puri.	Textbook of Medical Biochemistry	Latest	Elsevier Publication , India
Namrata Chhabra.	Case oriented approach towards Biochemistry	Latest	Jaypee Brothers Medical Publishers
Divya shatty D'sza, Sowbhagya lakhsmi	An easy guide to Practical Biochemistry	Latest	

Paper Code	Name of Paper	Duration	Paper	Marks
BS-1103	Biochemistry	03 Hours	Second[I]	Max-100 Min-50

Goal

The broad goal of the biochemistry curriculum is to provide a comprehensive, scientific knowledge of the structure and development of the human body in order to understand the biochemical basis of disease presentations and patient management.

PAPER-II (MAX 100 MARKS)

PROTEIN CHEMISTRY : Core: Prerequisite: Aminoacids–Classification based on side chain properties, nutritional requirement. Classification of Amino acids based on metabolic fate Standard and non-standard amino acids. Biologically important peptides. Proteins–Definition, Classification based on chemical nature and solubility, functions, nutritional value. Structural organization of proteins (primary, secondary, super secondary structures/ motifs, domains, tertiary and quaternary structures).Bonds stabilizing protein structure.Structure function relationship of proteins□haemoglobin, myoglobin, collagen and Insulin. Denaturation □ definition, causes, properties of a denatured protein, significance. **Non core:** Isoelectric pH, Non□protein amino acids, Non□alpha amino acids, D□amino acids

PLASMA PROTEINS: Core: Functions and clinical significance of plasma proteins□Albumin,α,β and γ globulins. Acute phase reactants □ Positive and Negative (clinical significance). Biological Reference range of serum total protein, albumin, total globulin, C reactive protein. Multiple Myeloma. **Non core:** Separation and identification of plasma proteins by electrophoresis and precipitation reactions

IMMUNOLOGY:

Cellular and humoral components of immune system. Immunoglobulin Classes, structure, function relationship Innate and adaptive immune responses, self/non□self□recognition Role of T helper cells in immune responses. Ig class switching, Concept of Immune tolerance and Autoimmunity. Antigens and concepts in vaccine development – types of vaccines, immunological basis of vaccine development, recombinant DNA technology in vaccine development. **Non core:** Hypersensitivity reactions. Concept of graft rejection Phases of vaccine development.

PROTEIN AND AMINO ACID METABOLISM: Core: Digestion and absorption and associated disorders Amino acid pool. General reactions–Transamination, Transmethylation, Transdeamination, Deamination□Oxidative and non oxidative and their significance. Biogenic amines . Sources and fate of ammonia□Trapping, Transport and Disposal of ammonia, ammonia toxicity.Urea cycle and its disorders

Amino acid metabolism , Glycine – specialised products and their importance, Phenylalanine, Tyrosine–metabolic pathway, synthesis of catecholamines. Pheochromocytoma. Other specialised products formed from tyrosine and their importance Tryptophan□synthesis of serotonin and melatonin and their importance Carcinoid syndrome. Sulphur containing aminoacids–functions of cysteine, methionine synthesis of SAM, SAH, Homocysteine. Formation of Nitric oxide and its importance

Inborn errors of metabolism – enzyme defects, clinical features, laboratory diagnosis and biochemical basis of management of – PKU, Tyrosinosis, Alkaptonuria, Albinism, Homocystinuria, Maple syrup urine disease(MSUD) Important functions/products from histidine, serine, Aspartate, Asparagine, glutamate, glutamine, serine, branched chain aminoacids.Polyamines □ Examples and importance. **Non core:** Techniques to separate and identify amino acids.

NUCLEIC ACID CHEMISTRY: Core: Prerequisite: Nitrogenous bases:Purines and Pyrimidines(Major,Minor,FreeBases); Nucleosides and Nucleotides – Structure, examples, Importance.Nucleoside derivatives: NMP, NDP, NTPcAMP, SAM, PAPS, UDPsugars etc Synthetic Nucleotide Analogues and their application. Structure and function of DNA (B DNA). Structural organization of DNA to form chromatin(Primary and Secondary) Types of RNA (hnRNA, mRNA, rRNA,

tRNA, snRNA) with structure and functions microRNA(miRNA) and small interfering RNA(siRNA)and their applications in medicine. **Non core:** Different types of DNA

NUCLEOTIDE METABOLISM: Core: Prerequisite: Sources of atoms of urine and pyrimidine ring Salvage pathways of Purine and pyrimidine synthesis Catabolism of Purines, Uric acid and its importance. Etiology, manifestations and biochemical basis of clinical manifestations of–Gout, Lesch Nyhan syndrome,

Non core: SCID, Orotic aciduria, Diagnostic importance of Adenosine deaminase

MOLECULAR BIOLOGY: Core: Concept of Genomics, proteomics and metabolomics

DNA Metabolism- Cell cycle, DNA replication prokaryotic and eukaryotic replication, requirements, process, inhibitors.Telomere, Telomerase and its importance DNA repair mechanisms.Diseases associated with DNA repair–Eg. Xeroderma Pigmentosum Mutations, causes, types of mutation, Consequences with examples **RNA Metabolism** Transcription process, Transcriptional units, promoter regions, RNA polymerases in prokaryotes and eukaryotes. Differences between prokaryotic and Eukaryotic transcription Inhibitors of transcription process.Post transcriptional modifications of all types of RNA

Protein Biosynthesis- Genetic Code and its characteristics Requirements and activation of amino acids Translation in Eukaryotes. Inhibitors of Translation,Post translational modifications **Regulation of Gene expression** Gene, introns, exons, cistron.

Regulation of gene expression in prokaryotes with illustration of Lac Operon Regulation of gene expression in eukaryotes–Role of enhancers ,repressors,DNA regulatory elements, gene amplification, gene rearrangement, RNA processing, RNA editing, mRNA stability.

Non core: Role of transcriptional activators and coregulators, Protein folding–Role of Chaperones and Heat shock proteins, Alzheimers disease, Prion diseases. Protein targeting and sorting with associated disorders Eg,I cell disease Protein motifs in DNA regulatory proteins.Chromatin remodeling in regulation. Epigenetics

MOLECULAR BIOLOGY TECHNIQUES AND GENE THERAPY: Core:

Recombinant DNA technology, DNA cloning process and application PCR technique and its application Blotting techniques. Concept, types and application of gene therapy. DNA Polymorphism, SNP, VNTR,RFLP. DNA genomic and cDNA libraries, DNA Probes, DNA Microarrays, Overview of Human Genome Project HGP.

BIOCHEMISTRY OF CANCER: Cell cycle, regulation, abnormal cell growth, programmed cell death (apoptosis) Cell signaling (action of hormones and growth factors) – Cell surface receptors G protein coupled signaling, catalytic receptor signaling, steroid receptor signaling. Mutagens and carcinogens: Definitions, examples and their actions in carcinogenesis Protooncogenes and their activation, oncogenes, tumour suppressor genes and their role in development of cancer Oncogenic viruses (HPV and cervical cancer) Growth factors and their receptors. Tumour markers and their importance in diagnosis and prognosis of cancer Biochemical basis of cancer therapy – alkylating agents, antimetabolites, topoisomerase inhibitors, antibiotics, hormones, receptor blockers, radiotherapy etc Monoclonal antibodies and their application

Non core: Hybridoma technology, Estrogen and progesterone receptors and their clinical importance in breast cancer.

HEME METABOLISM: Core: Heme –Outline of Synthesis, porphyrias. Degradation of Heme,Bilirubin metabolism–synthesis, transport, conjugation, excretion. Jaundice–definition, types, causes, lab diagnosis Congenital hyperbilirubinemias. Hemoglobin – Adult, fetal and embryonic types Abnormal hemoglobins–carboxy, sulph, metHb.

Hemoglobinopathies–molecular defects, pathophysiological changes in thalassemias and sickle cell anemia.

Non core: p50 of hemoglobins

ORGAN FUNCTION TESTS: Core: Functions of Liver, Kidney, Thyroid and adrenals. Liver Function Tests: Tests based on Synthetic, Excretory, and Role of enzymes in hepatic dysfunction. Renal Function tests–Tests to assess glomerular and tubular functions Mechanism of action of Group I and Group II hormones. Thyroid function tests Adrenal function tests .**Non core:** Lab tests for evaluation of Infertility

FREE RADICALS AND ANTIOXIDANTS: Core: Free radicals, Reactive oxygen species (ROS), Reactive nitrogen species (RNS) Damaging effects of ROS on biomolecules, lipid peroxidation.Anti□oxidant defence system of our body–enzymes, vitamins, metabolites as antioxidants Role of oxidative stress in atherosclerosis, diabetes mellitus and cancer

Non core: Fenton and Haber Weiss reactions

XENOBIOTICS AND DETOXIFICATION: Core: Xenobiotics and disease caused. Biotransformation. **Phase –I reactions** Oxidation Hydroxylation Cytochrome P450 **Phase□II reactions.** Conjugation reactions□Glucuronic acid, Glutathione, Glycine. **Non core:** Other detoxification reactions reduction, hydrolysis, Acetylation, Methylation and reduction

CLINICAL CHEMISTRY: Core: Basic concepts of clinical chemistry laboratory Automation advantages. Quality control concepts (Internal and external quality control, precision, accuracy) Specimen collection and Common Pre analytical errors. Biological reference intervals Critical alerts. Ethics in Laboratory Medicine

Recommended books

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
DM Vasudevan	Textbook of Biochemistry for Medical students	Latest	Jaypee Brothers Medical Publishers
	Lippincotts' Illustrated reviews – Biochemistry	Latest	
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Divya shatty D'sza, Sowbhagya lakhsmi	An easy guide to Practical Biochemistry	Latest	

Department of Biochemistry, PCMS & RC, Bhopal

M.Sc. Program Outcomes (POs)

At the end of the MD training programme in Biochemistry, the post graduate student should have acquired competencies in the following areas, as detailed below.

PO1. Acquisition of knowledge - The student should be able to explain clearly concepts and principles of biochemistry and cell biology, including correlations of these with cellular and molecular processes involved in health and disease.

PO2. Teaching and training - The student should be able to effectively teach undergraduate students in medicine and allied health science courses **and** become competent **as** health care professionals and able to contribute to training of postgraduate students.

PO3. The student should be able to analyze, interpret, lab reports.

PO4. The student should be able to assist lab consultants in total quality management effectively and be capable to troubleshoot the errors and providing a reliable support service.

PO5. Research –

- The student should be able to carry out a research project from planning to publication
- The student should be able to pursue academic interests and demonstrate himself as life-long learner & to gain more expertise.

Course Articulation Matrix: (Mapping of COs with POs)

Course Outcome	Correlation with program outcome				
	PO-1	PO-02	PO-03	PO-04	PO-05
CO1	1	1	2	2	1
CO2	2	2	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Name of Course:-M.Sc. Course Code- **MY-103** Year/Semester- **I**

Session-2019-20

Scheme of Course:- M.Sc. (Medical Biochemistry)

Course Objective:-

Course Outcomes: At the end of the course the student, after undergoing the training, should be able to:

1. Explain the **Biochemical**concepts related to **medical conditions** in clinical (medical)laboratory
2. **Describe** the metabolic role of nutrients and its metabolitesin physiological **as well as** pathologicalprocesses.
3. **Describe the metabolic role of played by major organs and tissues in physiological as well as pathological conditions.**
4. Explain**and clinically correlate** the metabolism of carbohydrates, proteins, lipidsand lipoproteins.
5. **Clinically** correlate metabolic processes and **suggest appropriate investigations for monitoringmetabolite concentration in specific diseases.**

Assessment Plan :-(For Reference & Sample) **Criteria**	**Description**	**Maximum Marks**
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Sessional Exam II		10
Attendance		75
Assignments		10
Group Work		10
End Term Exam (Summative)	End Term Exam	100
Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	
➢ Seminar ➢ Journal Club ➢ Group Discussion ➢ Project	M.Sc. Students regularly and monthly involved in these activities & assessed periodically & Constructive feedback given immediately.	

- **Department of Biochemistry**
- **M.Sc. (Medical Biochemistry)**
- **Theory Paper-III – Section (A)**

Paper Code	Paper name	Duration	Theory	Practical
MY-103	Human Biochemistry	3 Hrs.	Maximum Marks-80 Minimum Marks-40	Nil

Unit	Contents
1.	**Introduction and Scope of Biochemistry**
2.	**Cell and Cell Membrane:** Structure, general and specific features of cell, Fluid mosaic model, Mechanism, active transport, passive transport, Endocytosis.
3.	**Enzymes:** General nature, classification of enzymes, specificity, mode of action of enzymes, factors affecting enzyme activity Enzyme inhibition (Kinetic not required), Coenzymes, Clinical importance. (Diagnostic, therapeutic and as a laboratory reagent) of enzymes and isoenzymes.
4.	**Chemistry of Proteins:** General nature of amino acids, various ways of classification of amino acids, Biologically important peptides, Classification, properties and biological importance of proteins, Structure organization of proteins, Plasma protein- functions, clinical significance of various fractions method of separation (only principle)
5.	**Metabolism of Proteins:** Biochemical aspects of digestion and absorption of proteins, Fate of amino acid in the body: Deamination, Traansamination, Transdemination, Deccarboxylation, Fates of ammonia (Urea cycle, glutamine formation), Metabolism of aromatic and sulphur containing amino acids and their inborn errors, Metabolism of Glycine, Synthesis of creatine, phosphocreatine, Formation of Creatinine and clinical significance of Creatinine creance.
6.	**Chemistry and Metabolism of Purines and Pyrimidines:** B synthesis of purines (sources of ring & regularly steps only, converstion of IMP to GMP AMP) and salave pathway. Biosynthesis of pyrimidnes, Breakdown of purines and pyrmidines, Gout Lesch- Nyhan Syndrome.
7.	**Chemistry of Nucleic Acid:** Definition and biological importance, Classification and composition, Nucleosides, Nucleosides, Nucleotides, Biologically important free nucleotides. DNA: Structure and function, RNA: Types of RNA, Structure and function.
8.	**Molecular Biology:** DNA Replication, Transcription, Translation, Chain initiation, chain elongation, chain termination, Inhibitors of protein biosynthesis, Molecular mechanism of gene expression and regulation, Lace-operon model, PCR Genetic Engineering, Mutations.
9.	**Genetic Engineering:** Recombinant DNA, Restriction endonuclease Chimric molecule, Gene library, Applications cf recombinant DNA technology in relation to medicine.
10.	**Haemoglobin and Haemoglobin Metabolism:** Chemistry and functions of haemoglobin, Types of normal and abnormal haemoglobins. (HbS, M. Thalassemia) Haemoglobin derivatives, Synthesis and break down of Haemoglobin, porphyria (in brief), Fate of bilirubin, different types of Jaundice.
11.	**Biological Oxidation:** General concept of oxidation and reduction. Role of Enzymes and co-enzymes, Electron transport chain, Substrate level and oxidative phosphorylation, Role of uncouplers and inhibitors.
12.	**Molecular concept of body defence and their applications:** Immunoglobulins structure & functions, Free radicals, enzymatic and non enzymatic antioxidants.
13.	**Vitamins:** General nature, classification, fat soluble and water soluble vitamins source, active

	forms and metabolic role, deficiency manifestations, daily requirement and hypervitaminosis.
	Nutrition: Balance diet for normal adult, Quality of dietary protein, BMR, RQ, SDA, Dietar, Fibres, Protein energy malnutrition (kwashiorkor and marasmus)
5.	**Cardiovascular diseases hyperlipidemias:** Biochemical tests for Atherosclerosis and Myocardial Infraction: Lipid Profile, Apoproteins, Homosysteine and C-reactive protein, CKMB, Troponin.

➢ M.Sc. (Medical Biochemistry)

➢ Theory Paper-III – Section (B)

Paper Code	Paper name	Duration	Theory	Practical
MY-103	Human Biochemistry	3 Hrs.	Maximum Marks-80 Minimum Marks-40	Nil

Unit	Contents
1.	**Chemistry of Carbohydrates :** Classification and biochemical importance chemistry and functions of monosaccharide's, disaccharides and polysaccharides, glycosaminoglycans (mucopolysaccharides)
2.	**Metabolism of Carbohydrates:** Biochemical aspects of digestionand absorption of carbohydrates, Synthesis and break down of glycogen, Glycolysis, Rapoport, Lumbering cycle, Citric acid cycle, Gluconeogenesis, HMP shunt pathway and its biological significance, Uronic acid pathway (significance only),Metabolism of Galactose, Blood Sugar level and its regulation oral GTT and glycosuria, Lactose intolerance, Biochemistry of diabetes mellitus, Diagnostic and prognostic importance of glaciated hemoglobin.
3.	**Chemistry of Lipids:** Classification and biological importance of triacyl glycerol, phospholipids, glycolipids , fatty acids (PUFA)
4.	**Metabolism of Lipids:** Biochemical aspects of digestion and absorption of lipids, Beta-oxidation, biosynthesis of saturated fatty acids, Cholesterol biosynthesis, transport (Role of HDL & LDL) Excretion , Ketogenesis, Ketolysis and Ketosis, Adipose tissue metabolism Lipolysis and re-esterificatin, Fatty liver and atherosclerosis, prostaglandins.
5.	**Mineral Metabolism:** Study of (i) calcium and phosphorus, (ii) sodium potassium & chloride (iii) Magnesium, copper & iodine: (iv) Iron (v) Manganese, selenium, zinc & fluoride. Their importance body in brief.
6.	**Water and Electrolyte balance and imbalance Acid base balance and imbalance**
7.	**Integrated Metabolism and Starvation:** Metabolic interrelationship of carbohydrates, Lipid and Protein Metabolism, Metabolism in starvation.
8.	**Hormones:** General Characteristics and Mechanism of hormone action cAMP the second messenger, Phosphotidyl insosito/calcium system as second messenger.
9.	**Environmental Biochemistry:** Definition, chemical stress, air & water pollution
10.	**Organ Function Tests:** Liver Function Tests, Kidney Function Tests & Thyroid Function Tests

	Detoxification: (Bio-transformation) Oxidation,, reduction, conjugation hydrolysis, Cytochrome P450
	Biochemistry of Cancer: Carcinogens, and outline mechanism of carcinogenesis. Tumor markers
3.	**Radioisotopes:** Uses of radioisotopes (therapeutic, diagnostic), Hazards.
14.	**Investigation Technique (LCD Topics) :** Colorimeter, Electrophoresis, Chromatography, Flame Photometer, pH Measurement.

➢

Text Books:-			
Name of Authors	**Titles of the Book**	**Edition**	**Name of the Publisher**
DM Vasudevan	Textbook of Biochemistry for Medical students	Latest	Jaypee Brothers Medical Publishers
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Varley Horold	Practical Clinical Biochemistry	Latest	
Kaplan, Lawrence	Clinical Biochemistry	Latest	
Nelson David. L.	Lehninger Principle of Biochemistry	Latest	
Mahajan B.K.	Methods in Biostatistics for Medical Student and research work.	Latest	
David Beakar	Harper's illustrated Biochemistry	Latest	

MBBS Program Outcomes (POs)

At the end of MBBS program, the medical student should be able to:

- **PO 1**: Have a solid foundation of the structures and functions of different organ systems in the human body to develop a sound understanding about normal structure and functions, and is able to link diseases and medical conditions to such basic aspects.
- **PO 2**: Develop ability to identify any deviations from normal in terms of functional as well as structural deviations which form the basis of different diseases. To understand such deviations in details has clear understanding on the methods and investigations to be used for detecting them
- **PO 3**: To have a clear understanding on therapeutic options which can be employed for treating different disease conditions.
- **PO 4:** Diagnose and manage common health problems of the individual and the community, commensurate with his/her position as a member of the health team at the primary, secondary or tertiary levels, using his/her clinical skills based on history, physical examination and relevant investigations.
- **PO 5**:Able to understand and investigate causes of deaths which are unnatural, including involvement of any foul play
- **PO 6**:Practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems.
- **PO 7**:Appreciate rationale for different therapeutic modalities, be familiar with the administration of the "essential drugs" and their common side effects.
- **PO 8**:Appreciate the socio-psychological, cultural, economic and environmental factors affecting health and develop humane attitude towards the patients in discharging one's professional responsibilities.
- **PO 9**:Becomes well acquainted with various National Health Programs, and the ways in which they are being implemented.
- **PO 10**:Demonstrate communication skills, both verbal and written to establish effective communication with the clients (patients, relatives, and general public), health team partners, and scientific community.
- **PO 11**:Develop attitude for self-learning and acquire necessary skills including the use of appropriate technologies, for pursuing self-directed learning for a life time.
- **PO 12**:Possess ethical and compassionate approach towards human beings while they are suffering from ailments or otherwise, assist them overcoming such distresses protecting them from any kind of exploitation.
- **PO 13**: Understands the health problems of communities and works to develop strategies and interventions to address them.

COURSE OUTCOME

At the end of course student should be able to

- **CO1**: Comprehend the normal disposition, clinically relevant interrelationships, functional and cross sectional anatomy of the various structures in the body;

- **CO2**: Identify the microscopic structure and correlate elementary ultra structure of various organs and tissues and correlate the structure with the functions as a prerequisite for understanding the altered state in various disease processes;
- **CO3**: Comprehend the basic structure and connections of the central nervous system to analyze the integrative and regulative functions of the organs and systems. He/She shall be able to locate the site of gross lesions according to the deficits encountered.
- **CO4**: Demonstrate knowledge of the basic principles and sequential development of the organs and systems; recognize the clinical stages of development and the effects of common teratogens. He/She shall be able to explain the developmental basis of the major variations and abnormalities.
- **CO5**: Identify and locate all the structures of the body and mark the topography of the living anatomy. Identify the organs and tissues under the microscope; Understand the principles of karyotyping and identify the gross congenital anomalies;
- **CO6**: Understand the principles of newer imaging techniques like Ultra sound, Computerised Tomography Scan, Interpretation of plain and contrast X – rays. Understand clinical basis of some common clinical procedures i.e. intramuscular and intravenous injection, lumbar puncture, kidney biopsy etc

Course Articulation Matrix: (Mapping of COs with POs)

Course Outcomes	CORRELATION WITH PROGRAM OUTCOMES												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13
CO1	3	3						1	2	2	1	2	2
CO2	3	3						2	2	2	2	1	2
CO3	3	3						2	2	1	2	2	1
CO4	3	3						2	1	1	1	2	1
CO5	3	3						1	2	1	2	2	2
CO6	3	3						2	1	1	2	1	2

PEOPLE'S UNIVERSITY, BHOPAL

Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

Question paper layouts for theory examinations

PAPER 2

Version1

Q.1 MCQ: **10X1=10**

Long Question no. 1(I to X) (2 Each from lower limb, abdomen, pelvis, systemic embryology and 1 each from systemic histology and genetics)

Essay:(one structured long essay and other case based structured long essay) **2 X 15 =30**

2	Lower limb
3	Abdomen

Short Essays:(any 6) **6 X 5 =30**

4	Perineum
5	Abdomen
6	Pelvis
7	Genetics
8	Systemic histology
9	Systemic embryology
10	**ONE EXTRA QUESTION**

Short Answers: (any 10) **3 X 10 =30**

11	Lower limb
12	Abdomen
13	Abdomen
14	Abdomen
15	Pelvis
16	Pelvis
17	Perineum
18	Genetics
19	Systemic histology
20	Systemic embryology
21	**ONE EXTRA QUESTION**

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As per the MCI Regulations on Graduate Medical Education (Amendment), 2019.

Program	Paper Code	Duration	Theory		Professional
1ST MBBS, Anatomy			Maximum Marks	Minimum Marks	
Anatomy Paper -1	BS-1101	3 Hrs	100	50	First
Anatomy Paper -2	BS-1101	3 Hrs	100	50	

Theory paper will be prepared by the Examiners as prescribed. Nature of questions will be MCQs, structured long essay questions, short answer type and marks for each part indicated separately.

BLUE PRINT OF QUESTION TYPE

TABLE: TYPE, NUMBER OF QUESTIONS AND DISTRIBUTION OF MARKS FOR WRITTEN PAPER FOR ANATOMY, PHYSIOLOGY AND BIOCHEMISTRY

Type Of Questions	Pattern of question numbers	No Of Ques.	Marks for Each Que	Total Marks
MCQ (Multiple Choice Questions) type questions	Q.1 (I to X)	10	01	10
Long Essay (Structured)	Q. 2 - Q.3	02	15	30
Short Essay type questions type questions	Q.4 – Q.10	07 (6 out of 7)	05	30
Short Answers type questions	Q.11 – Q.21	11 (10 out of 11)	03	30
Total		28		100

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BLUEPRINT OF WEIGHTAGE OF MARKS OF ANATOMY PAPER WISE AND TOPIC WISE.

Paper 1

TOPIC	Arteries	Veins	Nerves	Muscles	Space	Bones	Joints	Connective tissue	Organs	Others	Marks
General Anatomy											6
General histology											5
General embryology											8
Upper limb											18
Thorax (including diaphragm)											21
Head and neck											29
Neuroanatomy											13
TOTAL											100

Paper 2

TOPIC	Arteries	Veins	Nerves	Muscles	Space	Bones	Joints	Connective tissue	Organs	Others	Marks
Systemic histology											11
Systemic embryology											11
Genetics											8
Lower limb											18
Abdomen											31
Pelvis and perineum											21
TOTAL											100

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Question paper layouts for theory examinations

PAPER1

Version1

Q.1 MCQ: **10X1=10**

Question no. 1(I to X) (2 Each from upper limb, head and neck, neuroanatomy, Thorax and 2 from general Anatomy/general embryology/general histology)

Long Essay:(one structured long essay and other case based structured long essay) **2X 15 =30**

2	Upper limb
3	Head and neck

Short Essays: (Any 6). **6x 5 = 30**

4	Thorax including diaphragm
5	Thorax including diaphragm
6	Head and neck
7	Neuroanatomy
8	General embryology
9	General histology
10	**ONE EXTRA QUESTION**

Short Answers: (Any 10) **3X10 = 30**

11	Upper limb
12	Thorax including diaphragm
13	Thorax including diaphragm
14	Thorax including diaphragm
15	Head and neck
16	Head and neck
17	Neuroanatomy
18	Neuroanatomy
19	General anatomy
20	General embryology
21	ONE EXTRA QUESTION

PEOPLE'S UNIVERSITY, BHOPAL

Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

PAPER1

Version 2

Q.1 MCQ: **10X1=10**

Question no. 1(I to X) (2 Each from upper limb, head and neck, neuroanatomy, Thorax and 2 from general Anatomy/general embryology/general histology)

Long Essay:(one structured long essay and other case based structured long essay) **2X 15 =30**

2	Thorax including diaphragm
3	Head and neck

Short Essays: (Any 6) **6x 5 = 30**

4	Upper limb
5	Upper limb
6	Head and neck
7	Neuroanatomy
8	General embryology
9	General histology
10	**ONE EXTRA QUESTION**

Short Answers: (Any 10) **3X10 =30**

11	Upper limb
12	Upper limb
13	Thorax including diaphragm
14	Thorax including diaphragm
15	Head and neck
16	Head and neck
17	Neuroanatomy
18	Neuroanatomy
19	General anatomy
20	General embryology
21	**ONE EXTRA QUESTION**

PEOPLE'S UNIVERSITY, BHOPAL

Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

Question paper layouts for theory examinations

PAPER 2

Version 2

Q.1 MCQ: **10X1=10**

Question no. 1(I to X) (2 Each from lower limb, abdomen, pelvis, systemic embryology and 1 each from systemic histology and genetics)

Long Essay:(one structured long essay and other case based structured long essay). **2X 15 =30**

2	Lower limb
3	Pelvis

Short Essays: (any 6) **6 X 5 =30**

4	Perineum
5	Abdomen
6	Abdomen
7	Genetics
8	Systemic histology
9	Systemic embryology
10	**ONE EXTRA QUESTION**

Short Answers: (any 10) **3 X 10 =30**

11	Lower limb
12	Lower limb
13	Abdomen
14	Abdomen
15	Abdomen
16	Abdomen
17	Pelvis
18	Genetics
19	Systemic histology
20	Systemic embryology
21	**ONE EXTRA QUESTION**

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Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

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Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

Paper Code	Name of Paper	Duration	Paper	Marks
BS-1101	Human Anatomy	03 Hours	First[I]	Max-100 Min-50

Goal

The broad goal of the anatomy curriculum is to provide a comprehensive, scientific knowledge of the structure and development of the human body in order to understand the anatomical basis of disease presentations and patient management.

PAPER-I **(MAX 100 MARKS)**

GENERAL ANATOMY

Anatomical terminology (AN1.1) Normal anatomical position, Planes of the body, Terms used for relations and comparison, Terms used for movements of the body. **General features of bones and Joints (AN1.2, AN2.1 to AN2.6)** Composition of bone and bone marrow, Parts, blood and nerve supply of a long bone, Laws of ossification*, Special features of a sesamoid bone*, Types of cartilage with its structure and distribution in body, Joints with subtypes and examples, Nerve supply of joints and Hilton's law. **General features of Muscle (AN3.1 to AN3.3)** Classification of muscle tissue according to structure and action, Parts of skeletal muscle, Differences between tendons and aponeuroses with examples, Shunt and spurt muscles*.**General features of skin and fascia (AN4.1 to AN4.5)** Types of skin and dermatomes in body*, Structure and function of skin, Superficial fascia along with fat distribution in body, Modifications of deep fascia with its functions Principles of skin incisions*.**Topic: General features of the cardiovascular system (AN5.1 to AN5.8)** Differences between blood vascular and lymphatic system, Differences between pulmonary and systemic circulation, General differences between arteries and veins, Functional differences between elastic, muscular arteries and arterioles, Concept of portal system with examples ,Concept of anastomoses and collateral circulation with significance of end-arteries, Functions of meta-arterioles, precapillary sphincters, arterio-venous anastomoses*, Definition of thrombosis, infarction and aneurysm*.**Topic: General Features of lymphatic system (AN6.1 to AN6.3)** Components and functions of the lymphatic system, Structure of lymph capillaries and mechanism of lymph circulation*,Concept of lymphoedema and spread of tumors via lymphatics and venous system*.**Introduction to the nervous system (AN7.1 to AN7.8)** General plan of nervous system with components of central, peripheral and autonomic nervous systems, Components of nervous tissue and their functions, Parts of a neuron, Classification of neurons based on structure and function, Structure of a typical spinal nerve, Principles of sensory and motor innervation of muscles*, Concept of loss of innervation of a muscle with its applied anatomy, Type of synapses*,Differences between sympathetic and spinal ganglia*

GENERAL HISTOLOGY

Epithelium (AN65.1 to AN65.2)

Identification of epithelium under the microscope, Correlation of structure and function of epithelia, Ultrastructure of epithelium*. **Connective tissue histology (AN66.1 to AN66.2)** Types of connective tissue with functional correlation, Ultrastructure of connective tissue*. **Muscle histology (AN67.1 to AN67.3)** Classification of muscle, Structure-function correlation of muscle, Ultrastructure of muscle tissue*. **Nervous tissue histology (AN68.1 to AN68.3)** Description and identification of unipolar and multipolar neurons, ganglia, peripheral nerve, Structure-function correlation of neuron, Ultrastructure of nervous tissue*. **Blood vessels – histology (AN69.1 to AN69.3)** Identification of elastic and muscular blood vessels, capillaries under the microscope, Types and structure-function correlation of blood vessels, Ultrastructure of blood vessels*. **Glands and Lymphoid tissue (AN70.1 toAN70.2)** Identification of exocrine glands under the microscope, Differentiation between serous, mucous and mixed acini, Identification of lymphoid tissue under the microscope, Microanatomy of lymph node, spleen, thymus, tonsil and correlation of structure with function. **Bone and Cartilage (AN71.1 to AN71.2)** Identification of bone under the microscope, Types and structure-function correlation of bone, Identification of cartilage under the microscope, Types and structure function correlation of cartilage. **Integumentary System (AN72.1)** Identification of skin and its appendages under the microscope, Correlation of structure and function.

GENERAL EMBRYOLOGY

Introduction to embryology (AN76.1 TO AN76.2) Stages of human life, Terms - phylogeny, ontogeny, trimester, viability. **Gametogenesis and fertilization (AN77.1 to AN77.6)** Uterine changes occurring during the menstrual cycle, Synchrony between the ovarian and menstrual cycles, Spermatogenesis and oogenesis. Stages and consequences of fertilization, Anatomical principles underlying contraception, Teratogenic influences; fertility and sterility, surrogate mother hood, social significance of "sex- ratio" *. **Second week of development (AN78.1 to AN78.5)** Cleavage and formation of blastocyst, Development of trophoblast, Process of implantation and common abnormal sites of implantation, Formation of extra-embryonic mesoderm and coelom, bilaminar disc and prochordalplate, Abortion, decidual reaction, pregnancy tests. **3rd to 8th week of development (AN79.1 to AN79.6)** Formation and fate of the primitive streak, Formation and fate of notochord Process of neurulation, Development of somites and intra-embryonic coelom, Embryological basis of congenital

malformations, nucleus pulposus, sacrococcygeal teratomas, neural tube defects, Diagnosis of pregnancy in first trimester*, Role of teratogens, alpha-fetoprotein*. **Fetal membranes (AN80.1 to AN80.7)** Formation, functions and fate of chorion, amnion, yolk sac, allantois and decidua, Formation and structure of umbilical cord, Formation of placenta, its physiological functions, foeto-maternal circulation and placental barrier, Embryological basis of twinning in monozygotic and dizygotic twins. Role of placental hormones in uterine growth and parturition, Embryological basis of estimation of fetal age*, Types of umbilical cord attachments*. **Prenatal Diagnosis (AN81.1 to AN81.3)** Methods of prenatal diagnosis, Indications, process and disadvantages of amniocentesis, Indications, process and disadvantages of chorion villus biopsy.

UPPER LIMB

Features of individual bones (Upper Limb) (AN8.1 to AN8.6) Clavicle, scapula, humerus, radius, ulna - side determination, anatomical position and important features, joints formed by the given bone, Peculiarities of clavicle, Muscle group attachments on above bones, Identification and naming of bones in articulated hand, Parts of metacarpals and phalanges, Peculiarities of pisiform, Scaphoid fracture and basis of avascular necrosis*.**Pectoral region (AN9.1 to AN 9.3)** Pectoralis major, pectoralis minor - attachment, nerve supply and action. Breast - location, extent, deep relations, structure, age changes, blood supply, lymphatic drainage, microanatomy and applied anatomy, Development of breast*. **Axilla, Shoulder and Scapular region (AN 10.1 to AN10.13)** Axilla - boundaries and contents, Axillary artery and tributaries of vein-origin, extent, course, parts, relations and branches, Brachial plexus - formation, branches, relations, area of supply of branches, course and relations of terminal branches. Axillary lymph nodes - anatomical groups and areas of drainage. Variations in formation of brachial plexus Erb's palsy and Klumpke's paralysis - anatomical basis and clinical features*, Enlarged axillary lymph nodes – anatomical basis*, Latissmusdorsi and trapezius- location, attachment, nerve supply and actions, Arterial anastomosis around the scapula*,Boundaries of triangle of auscultation*, Deltoid and rotator cuff muscles, Serratus anterior - attachment and actions, **Shoulder joint**-type, articular surfaces, capsule, synovial membrane, ligaments, relations, movements, muscles involved, blood supply, nerve supply and applied anatomy. Anatomical basis of injury to axillary nerve during intramuscular injections*. **Arm and Cubital fossa (AN11.1 to AN11.6)** Muscle groups of upper arms, Biceps and triceps brachii, Important nerves and vessels in arm - origin, course, relations, branches (or tributaries), termination, Venepuncture of cubital veins – anatomical basis. Saturday night paralysis – anatomical basis, Cubital fossa - boundaries and contents, Anastomosis around elbow joint***Forearm and hand (AN12.1 to AN12.15)** Ventral forearm - muscle groups with attachments, nerve supply and actions, Nerves and vessels of forearm - origin, course, relations, branches (or tributaries), termination, Flexor retinaculum - identification and attachments, Anatomical basis of carpal tunnel syndrome, Small muscles of hand, Movements of thumb and muscles involved, Blood vessels and nerves in hand - course and branches, Anatomical basis of claw hand, Fibrous flexor sheaths, ulnar bursa, radial bursa and digital synovial sheaths, Infection of fascial spaces of palm*. Dorsal forearm - muscle groups, attachments, nerve supply and actions, Origin, course, relations, branches (or tributaries), termination of important nerves and vessels of back of forearm, Wrist drop – anatomical basis, Compartments deep to extensor retinaculum, Extensor expansion – identification and formation. **General Features, joints, radiographs and surface marking (AN13.1 to AN13.8)** Fascia of upper limb and compartments, Veins of upper limb, Lymphatic drainage of upper limb, Dermatomes of upper limb*. Elbow joint, proximal and distal radio-ulnar joints, wrist joint and first carpometacarpal joint - type, articular surfaces, capsule, synovial membrane, ligaments, relations, movements, blood and nerve supply. Sternoclavicular joint, acromioclavicular joint, carpometacarpal joints and metacarpophalangeal joints*. Bones and joints of upper limb seen in anteroposterior and lateral view radiographs of shoulder region, arm, elbow, forearm and hand. Bony landmarks of upper limb - jugular notch, sternal angle, acromial angle, spine of the scapula, vertebral level of the medial end, inferior angle of the scapula. Surface projection of cephalic and basilic vein, Palpation of brachial artery and radial artery, Testing of muscles: trapezius, pectoralis major, serratusanterior, latissimusdorsi, deltoid, biceps brachii, brachioradialis, Development of upper limb*

THORAX

Thoracic cage (AN21.1 to AN21.11) Salient features of sternum, typical rib, 1st rib and typical thoracic vertebra. Features of 2nd, 11th and 12th ribs*, Features of 1st, 11th and 12ththoracic vertebrae*, Boundaries of thoracic inlet, cavity and outlet, Extent, attachments, direction of fibres, nerve supply and actions of intercostal muscles, Course, relations and branches of a typical intercostal nerve. Origin, course and branches / tributaries of anterior, posterior intercostal vessels and internal thoracic vessels. Origin, course, relations and branches of atypical intercostal nerve, superior intercostal artery and subcostal artery*

Type, articular surfaces and movements of manubriosternal, costovertebral, costotransverse and xiphisternal joints. Mechanics and types of respiration. Costochondral and interchondral joints*

Boundaries and contents of the superior, anterior, middle and posterior mediastinum. **Heart and Pericardium (AN22.1 to AN22.7)** Pericardium - subdivisions, sinuses, blood supply and nerve supply, External and internal features of each chamber of the heart, Origin, course and branches of coronary arteries, Anatomical basis of ischaemic heart disease, Formation, course, tributaries and termination of coronary sinus, Fibrous skeleton of heart, Position and arterial supply of the conducting system of heart. **Mediastinum (AN23.1 to AN23.7)**

Oesophagus - external appearance, relations, blood supply, nerve supply, lymphatic drainage and applied anatomy, Thoracic duct - extent, relations, tributaries and applied anatomy, Origin, course, relations, tributaries and termination of superior venacava, azygos, hemiazygos and accessory hemiazygos veins, Branches and relations of arch of aorta and descending thoracic aorta, Location and extent of thoracic sympathetic chain, Description of splanchnic nerves*, Right lymphatic duct – extent, relations and applied anatomy. **Lungs and Trachea (AN24.1 to AN24.6, AN25.1 to AN25.6)** Pleura – extent, recesses with their applied anatomy, blood supply, lymphatic drainage and nerve supply. Lungs – side determination, external features including root and clinical correlates, Description of bronchopulmonary segments, Phrenic nerve - formation and distribution, Blood supply, lymphatic drainage and nerve supply of lungs, Extent, length, relations, blood supply, lymphatic drainage and nerve supply of trachea*. **Diaphragm** Thoraco-abdominal diaphragm – attachments, major and minor openings, nerve supply and actions, Thoraco-abdominal diaphragm - abnormal openings and diaphragmatic hernia*.

Radiological anatomy of thorax (AN25.7 and AN25.8) Identification of structures seen on a plain x-ray chest (PA view), dentification of and description in brief of a barium swallow*, **Surface marking of thorax (AN25.9)** Demonstrate surface marking of lines of pleural reflection, lung borders and fissures, trachea, heart borders, apex beat and surface projection of valves of heart.

HEAD AND NECK

Skull osteology (AN26.1 to AN26.7)

Anatomical position of skull, Identification and naming of individual skull bones, Features of norma frontalis, verticalis, occipitalis, lateralis and basalis. Cranial cavity - subdivisions, foramina and structures passing through them, Morphological features of mandible, Features of typical and atypical cervical vertebrae (atlas and axis) Concept of membranous ossification*, Features of the 7th cervical vertebra*, **Scalp (AN27.1 and AN27.2)** Scalp - layers, blood supply, nerve supply and surgical importance, Emissary veins and their role in spread of infection from extra cranial route to intracranial venous sinuses. **Face and parotid region (AN28.1 to AN28.10)**Muscles of facial expression and their nerve supply, Sensory innervation of face, Origin / formation, course, branches / tributaries of facial vessels, Branches of facial nerve with distribution, Cervical lymph nodes and lymphatic drainage of head, face and neck, Superficial muscles of face, their nerve supply and actions, Anatomical basis of facial nerve palsy, Surgical importance of deep facial vein. Parotid gland - parts, borders, surfaces, contents, relations, nerve supply, course of its duct and surgical importance. Anatomical basis of Frey's syndrome*. **Posterior triangle of neck (AN29.1 to AN29.4)** Sternocleidomastoid - attachments, nerve supply, relations and actions, Anatomical basis of Erb's and Klumpke's palsy, Anatomical basis of wry neck*, Attachments of inferior belly of omohyoid, scalenus anterior, scalenusmedius and levator scapulae*. **Cranial cavity (AN30.1 to AN30.5)** Cranial fossae and related structures, Major foramina with structures passing through them, Identification and description of dural folds and dural venous sinuses, Clinical importance of dural venous sinuses, Effect of pituitary tumours on visual pathway*.**Orbit (AN31.1 to AN31.5)** Extraocular muscles – demonstration and description. Nerves and vessels in the orbit - demonstration and description, Anatomical basis of Horner's syndrome*. Components of lacrimal apparatus, Anatomical basis of oculomotor, trochlear and abducent nerve palsies along with strabismus. **Anterior triangle of neck (AN32.1 and AN32.2)** Boundaries and subdivisions of anterior triangle, Boundaries and contents of muscular, carotid, digastric and submental triangles. **Temporal and infratemporal region (AN33.1 to AN33.5)** Temporal and infratemporal fossae - extent, boundaries and contents, Muscles of mastication - attachments, direction of fibres, nerve supply and actions, Temporomandibular joint - articulating surface, type and movements. Clinical significance of pterygoid venous plexus, Features of dislocation of temporomandibular joint*. **Submandibular region (AN34.1 and AN34.2)** submandibular salivary gland - morphology, relations and nerve supply including submandibular ganglion Anatomical basis of formation of submandibular stones*.**Deep structures in the neck (AN35.1 to AN35.10)** Deep cervical fascia - parts, extent, attachments and modifications, Thyroid gland - location, parts, borders, surfaces, relations and blood supply, Subclavian artery - origin, parts, course and branches, Internal jugular and brachiocephalic veins - formation, course, relations, tributaries and termination. Cervical lymph nodes - extent, drainage and applied anatomy. Cervical sympathetic chain - extent, formation, relation and branches IX, X, XI and XII cranial nerves - course and branches in the neck. Anatomical basic of clinical features of thyroid swellings*

Anatomical basis of clinical features of compression of subclavian artery and lower trunk of brachial plexus by cervical rib*, Fascial spaces of neck*. **Mouth, pharynx and palate (AN36.1 to AN36.5)** Palatine tonsil - morphology, relations, blood supply and applied anatomy. Composition of soft palate, Waldeyer's lymphatic ring - components and functions, Pyriform fossa - boundaries and clinical significance*. Anatomical basis of tonsillitis, tonsillectomy, adenoids and peri-tonsillar abscess*. Clinical significance of Killian's dehiscence*. **Cavity of nose (AN37.1 to AN37.3)** Nasal septum and lateral wall of nose – features, blood supply and nerve supply, Paranasal sinuses - location and functional anatomy. Anatomical basis of sinusitis and maxillary sinus tumours*. **Larynx (AN38.1 to AN38.3)** Larynx - morphology, structure of the walls, nerve supply, blood supply and actions of intrinsic and extrinsic muscles. Anatomical aspects of laryngitis*, Anatomical basis of recurrent laryngeal nerve injury*. **Tongue (AN39.1 and AN39.2)** Tongue - morphology, nerve supply, embryological basis of nerve supply, blood supply, lymphatic drainage and actions of extrinsic and intrinsic

muscles, Anatomical basis of hypoglossal nerve palsy*.**Organs of hearing and equilibrium (AN40.1 to AN40.5)**External ear - parts, blood supply and nerve supply, Middle ear and auditory tube - boundaries, contents, relations and functional anatomy, Features of internal ear*,Anatomical basis of otitis externa and otitis media*,Anatomical basis of myringotomy* .**Eyeball (AN41.1 to AN41.3)** Eyeball - parts and layers, Anatomical aspects of cataract, glaucoma and central retinal artery occlusion*, Intraocular muscles - position, nerve supply and actions*. **Back region (AN42.1 to AN42.3)**Contents of the vertebral canal, Suboccipital triangle - boundaries and contents, Semispinalis capitis and splenius capitis - position, direction of fibers, relations, nerve supply and actions*.**Head and neck joints, radiography and surface marking (AN43.1 to AN43.9)** Atlantooccipital joint and atlantoaxial joint - movements with muscles producing them, Testing of muscles of facial expression, extraocular muscles and muscles of mastication, Palpation of arteries - carotid, facial and superficial temporal arteries, Location of-hyoid bone, thyroid cartilage and cricoid cartilage with their vertebral levels, Surface marking- thyroid gland, parotid gland and duct, pterion, common carotid. artery, internal jugular vein, subclavian vein, external jugular vein, facial artery in the face and accessory nerve, Identify the anatomical structures in 1) Plain X-ray skull–AP and lateral. view; 2) Plain X- ray cervical spine - AP and lateral view; 3) Plain X-ray of paranasal sinuses, Carotid and vertebral angiograms - anatomical route and anatomical structures*

CENTRAL NERVOUS SYSTEM AND ETHICS IN ANATOMY

Meninges and CSF (AN56.1 and AN56.2) Meninges - layers with their extent and modifications, Circulation of CSF with its applied anatomy, **Spinal cord (AN57.1 to AN57.5)**Spinal cord - external features, extent in child and adult with its clinical implications, Transverse section of spinal cord at mid-cervical and mid-thoracic level, Ascending and descending tracts at mid thoracic level of spinal cord, Anatomical basis of syringomyelia*.**Medulla oblongata (AN58.1 to AN58.4)** Medulla oblongata - external features, Transverse section of medulla oblongata at the level of 1) pyramidal decussation; 2) sensory decussation; 3) inferior olivary nucleus, Cranial nerve nuclei in medulla oblongata with their functional components. Anatomical basis and effects of medial and lateral medullary syndrome*. **Pons (AN59.1 to AN59.3)**Pons – external features, Transverse section of pons at the upper and lower level, Cranial nerve nuclei in pons with their functional components. **Cerebellum (AN60.1 to AN60.3)** Cerebellum - external and internal features, Connections of cerebellar cortex and intracerebellar nuclei, Anatomical basis of cerebellar dysfunction*. **Midbrain (AN61.1 to AN61.3)**Midbrain - external and internal features, Internal features of midbrain at the level of superior and inferior colliculus, Anatomical basis and effects of Benedikt's and Weber's syndrome*. **Cranial nerve nuclei and cerebral hemispheres (AN62.1 to AN62.6)** Cranial nerve nuclei with their functional components, Cerebral hemispheres – poles, surfaces, sulci, gyri and functional areas White matter of cerebrum in detail about internal capsule and corpus callosum, Basal ganglia and limbic lobe - parts and major connections. Dorsal thalamus, hypothalamus, epithalamus, metathalamus and subthalamus - boundaries, parts, gross relations, major nuclei and connections, Circle of Willis - formation, branches and major areas of distribution. **Ventricular system (AN63.1 and AN63.2)** Lateral, 3rd and 4th and ventricles - parts, boundaries and features.

(* 'Non-core' competencies as per "Competency based Undergraduate Curriculum for the Indian Medical Graduate 2018: Medical Council of India").

RECOMMENDED BOOKS

General anatomy

- Handbook of General Anatomy, BD Chaurasia / General Anatomy, VishramSingh

Histology

- diFiore's Atlas of Human Histology with Functional Correlation, Victor PEroschenko . Wheater's Functional Histology: A Text and Colour Atlas
- Textbook of Human Histology with colour Atlas, Inderbir Singh / Textbook of Histology and Practical Guide, Gunasegaran / Histology: Text and Atlas, BrijeshKumar

Embryology- Textbook of Human Embryology, Inderbir Singh / Langman's's textbook of Medical Embryology, TWSadler

Human genetics

- Human Genetics, SD Gangane / Medical Genetics, GP Pal / Emery's Elements of Human. Genetics, Peter Turnpenny and Sian Ellard

Gross anatomy including neuroanatomy

- Cunningham's Manual of Practical Anatomy Volumes I,II and III
- BD Chaurasia's / Dutta's / Vishram Singh's Textbook of Anatomy – all volumes
- Grant's atlas / McMinn's atlas / Netter'satlas
- Clinically Oriented Anatomy, K L Moore / Clinical Anatomy by Regions, Richard Snell / Clinical Anatomy (A Problem Solving Approach) (2 volumes), Neeta Kulkarni
- Gray's Anatomy for Students, South Asia Edition
- Clinical Neuroanatomy, Richard Snell / Textbook of Neuroanatomy, IB Singh / Textbook of Clinical Neuroanatomy, Vishram Singh

Surface and radiological anatomy

- Surface and radiological anatomy, A Halim / Surface and radiological anatomy, Ashwini Appaji and Roopa Kulkarni
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Others

- Stedman's Medical Dictionary
- Gray's Anatomy - The Anatomical Basis of Clinical Practice

*Newer editions of the above mentioned books are recommended.

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Programme:- MBBS **Professional -I** **Session -2019-20 onwards**

Reference books:

- GRAY'S ANATOMY 41st EDITION
- BD CHAURASIA GENERAL ANATOMY
- BD CHAURASIA VOL1
- BD CHAURASIA VOL2
- BD CHAURASIA VOL3
- BD CHAURASIA VOL4
- CUNNINGHAM DISSECTION MANUAL (UPPER AND LOWER LIMB)
- CUNNINGHAM DISSECTION MANUAL(THORAX ABDOMEN)
- CUNNINGHAM DISSECTION MANUAL (HEAD AND NECK AND BRAIN)
- Inderbir Singh HISTOLOGY
- IB SINGH EMBRYOLOGY

School of Pharmacy and Research, People's University

B.PHARM (Course Outcome)

Year	Subject	Outcome	Program Outcome
I year	**BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I CO1**	CO1 Imparts fundamental knowledge on the structure and functions of the various systems of the human body. CO2 Helps in understanding both homeostatic mechanisms. CO3 Provides the basic knowledge required to understand the various disciplines of pharmacy. CO4 Helpful for developing an insight on the subject.	PO1, PO6
	BP102T. PHARMACEUTICAL ANALYSIS CO3	CO1 Deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs including their principles, titrations and analytical skills. CO2. Understand the basic components of anatomy physiology of plant & physiology animal with special reference to human.	PO1, PO2, PO6
	BP103T. PHARMACEUTICS-I CO3	CO1 Imparts a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms. CO2. Pharmaceutical calculations and Preparation of various conventional dosage forms.	PO1,PO3, PO6, PO12
	BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY CO4	CO1 Deals with the monographs of inorganic drugs and pharmaceuticals. CO2.Understands the medicinal and pharmaceutical importance of inorganic compounds drugs and pharmaceuticals.	PO1, PO6
	BP105T.COMMUNICATION SKILLS CO5	CO1 Prepares the young pharmacy student to interact effectively with doctors, nurses,	PO9,PO10

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		dentists, physiotherapists and other health workers. CO2 Student gets the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.	
	BP 106RBT.REMEDIAL BIOLOGY **CO6**	CO1 Understand the components of living world, structure and functional system of plant and animal kingdom. CO2 Understand the salient features of the kingdoms of life.	PO1
	BP 106RMT.REMEDIAL MATHEMATICS **CO7**	CO1 Deals with the introduction to Partial fraction, Logarithm. matrices and Determinant. CO2 Analytical geometry, Calculus, differential equation and Laplace transform.	PO1
	BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II **CO8**	CO1 Imparts fundamental knowledge on the structure and functions of the various systems of the human body. CO2 Helps in understanding both homeostatic mechanisms. CO3 Provides the basic knowledge required to understand the various disciplines of pharmacy.	PO1, PO6
	BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I **CO9**	CO1 Deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions. CO2 It also deals with important physical properties, reactions and methods of preparation of these compounds. CO3 Emphasizes on mechanisms and orientation of reactions.	PO4, PO6
	BP203 T. BIOCHEMISTRY **CO10**	CO1 Deals with complete understanding of the molecular	PO1, PO6

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		levels of the chemical process associated with living cells. CO2 Provides biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. CO3 Emphasizes on genetic organization of mammalian genome and hetero & CO autocatalytic functions of DNA.	
	BP 204T.PATHOPHYSIOLOGY CO11	CO1 Imparts a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. CO2, Helps to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.	PO1, PO6
	BP205 T. COMPUTER APPLICATIONS IN PHARMACY CO12	CO1 Deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.	PO11
	BP 206 T. ENVIRONMENTAL SCIENCES CO13	CO1 Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. CO2 Includes physical and biological characters of the environment along with social and cultural factors and the impact of man on environment.	PO7
	BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II CO14	CO1 Deals with general methods of preparation and reactions of some organic compounds. CO2 Reactivity of organic compounds are also studied here. CO3 Emphasizes on	PO4, PO6

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		mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.	
II year	**BP302T. PHYSICAL PHARMACEUTICS-I CO15**	CO1 Deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. CO2 Demonstrate use of physicochemical properties in the formulation,development and evaluation of dosage forms	PO1, PO12
	BP 303 T. PHARMACEUTICAL MICROBIOLOGY CO16	CO1 Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc. CO2 Understand the cell culture technology and its applications in pharmaceutical industries. CO3 Understand methods of identification, cultivation and preservation of various microorganisms.	PO9, PO6
	BP 304 T. PHARMACEUTICAL ENGINEERING CO17	CO1 Imparts a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry. CO2 Carry out various test to prevent environmental pollution. CO3. Appreciate and comprehend significance of plant lay out design for optimum use of resources.	PO5, PO11
	BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III CO18	CO1 Imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. CO2 Emphasizes on medicinal and other uses of organic compounds.	PO4, PO6

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		CO3 Helps to write the reaction, name the reaction and orientation of reactions.	
	BP402T. MEDICINAL CHEMISTRY – I CO19	CO1 Imparts fundamental knowledge on the structure,chemistry and therapeutic value of drugs. CO2 Emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. CO3 Emphasizes on chemical synthesis of important drugs under each class.	PO4, PO6
	BP 403 T. PHYSICAL PHARMACEUTICS-II CO20	CO1 Deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. CO2 Understand various physicochemical properties of drug molecules in the designing the dosage forms.	PO1, PO12
	BP 404 T. PHARMACOLOGY-I CO21	CO1 Understand what drugs do to the living organisms and how their effects can be applied to therapeutics. CO2 Covers the information about the drugs like, mechanism of action, physiological and biochemical effects. CO3 Also Covers absorption, distribution, metabolism and excretion. CO4 Also deals with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.	PO1, PO6
	BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I CO22	CO1 Involves the fundamentals of Pharmacognosy like scope, classification of crude drugs. CO2 Deals with their	PO1, PO6

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		identification and evaluation. CO3 Also deals with phytochemicals present in them and their medicinal properties.	
III year	**BP501T. MEDICINAL CHEMISTRY – II** **CO23**	CO1 Imparts fundamental knowledge on the structure,chemistry and therapeutic value of drugs. CO2 Emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. CO3 Emphasizes on chemical synthesis of important drugs under each class	PO4, PO6
	BP 502 T. Industrial PharmacyI **CO24**	CO1 Course enables the student to understand and appreciate the influence of pharmaceutical additives. CO2 Understand various pharmaceutical dosage forms on the performance of the drug product. CO3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their Quality.	PO5, PO11
	BP503.T. PHARMACOLOGY-II **CO25**	CO1 Imparts the fundamental knowledge on various aspects (classification, mechanism of action. CO2 Also deals with therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body. CO3 Emphasizes is done on the basic concepts of bioassay.	PO1, PO6
	BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II **CO26**	CO1 Imparts the students the knowledge of how the secondary metabolites are produced in the crude drugs. CO2 Deals with how to isolate and identify and produce them industrially. CO3 Involves the study of	PO1, PO6

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		producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine	
	BP 505 T. PHARMACEUTICAL JURISPRUDENCE CO27	CO1 Imparts basic knowledge on important legislations related to the profession of pharmacy in India. CO2. Various Indian pharmaceutical Acts and Laws. CO3. The regulatory authorities and agencies governing the manufacture and sale of Pharmaceuticals. CO4. The code of ethics during the pharmaceutical practice.	PO5, PO8
	BP601T. MEDICINAL CHEMISTRY – III CO28	CO1 Imparts fundamental knowledge on the structure, chemistry and therapeutic value of drugs. CO2 Emphasizes on modern techniques of rational drug design like quantitative structure activity relationship (QSAR). CO3 Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). CO4 Emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.	PO4, PO6
	BP602 T. PHARMACOLOGY-III CO29	CO1 Imparts the fundamental knowledge on various aspects (classification, mechanism of action. CO2 Also about the therapeutic effects, clinical uses, side effects and Contraindications. of drugs acting on respiratory. and gastrointestinal system. CO3 Also deals with the study of infectious	PO1, PO6

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		diseases, immuno-pharmacology. CO4 Also emphasises on the principles of toxicology and chronopharmacology.	
	BP 603 T. HERBAL DRUG TECHNOLOGY **CO30**	CO1 Gives the student the knowledge of basic understanding of herbal drug Industry. CO2 Also deals with the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. CO3 Emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs.	PO1, PO6
	BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS **CO31**	CO1 Imparts knowledge and skills of Biopharmaceutics and pharmacokinetics. CO2 Deals with their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein. CO3.Understand the concepts of bioavailability and bioequivalence of drug products and their significance.	PO1, PO3, PO12
	BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY **CO32**	CO1 Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes subject interesting. CO2 Deals with new biological revolutions in diagnosis, prevention and cure of diseases. CO3 Deals with new and cheaper pharmaceutical drugs. CO4 It is basically a research-based subject.	PO9, PO6
	BP606TPHARMACEUTICAL QUALITY ASSURANCE **CO33**	CO1 Deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries.	PO5, PO8

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		CO2 Deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.	
IV year	**BP701T. INSTRUMENTAL METHODS OF ANALYSIS CO34**	CO1 Deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. CO2 Imparts a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. CO3 Emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.	PO2, PO5, PO6
	BP 702 T. INDUSTRIAL PHARMACYII CO35	CO1 Imparts fundamental knowledge on pharmaceutical product development and translation from laboratory to market. CO2. Understand the process of technology transfer from lab scale to commercial batch. CO3. Know different Laws and Acts that regulate pharmaceutical industry. CO4. Understand the approval process and regulatory requirements for drug product	PO5, PO6
	BP 703T. PHARMACY PRACTICE CO36	CO1 Helps in learning various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. CO2 Deals with various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication. CO3 Patient counseling for improved patient care in the community set up.	PO5, PO6, PO12
	BP 704T: NOVEL DRUG DELIVERY SYSTEMS	CO1 Imparts basic knowledge on the area of novel drug	PO1, PO3

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	CO37	delivery systems. CO2. Understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation.	
	BPS01T. BIOSTATISITCS AND RESEARCH METHODOLOGY **CO38**	CO1 Understand the applications of Biostatics in Pharmacy. CO2 Deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests& ANOVA. CO3 Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel.	PO6,PO9
	BP 802T SOCIAL AND PREVENTIVE PHARMACY **CO39**	CO1 Deals with health issues and their challenges. CO2 Introduced a number of national health programmes. CO3 The role of the pharmacist in these contexts are also discussed.	PO6, PO7
	BP803ET. PHARMA MARKETING MANAGEMENT **CO40**	CO1 The Knowledge and Know-how of marketing management CO2 Role in Sales and Product management.	PO5,PO6, PO11
	BP804 ET: PHARMACEUTICAL REGULATORY SCIENCE **CO41**	CO1 Fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other CO2 Prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.	PO5, PO8
	BP 805T:	CO1Basic terminologies used in	PO5, PO8

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	PHARMACOVIGILANCE CO42	pharmacovigilance, global scenario of Pharmacovigilance CO2 Develops the skills of classifying drugs, diseases and adverse drug reactions.	
	BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS CO43	CO1 Various methods and guidelines for evaluation and standardization of herbs and herbal drugs. CO2 Provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.	PO1
	BP 807 ET. COMPUTER AIDED DRUG DESIGN CO44	CO1 Provides detailed knowledge of rational drug design process and various techniques used in rational drug design process. CO2. The role of drug design in drug discovery process. CO3.The concept of QSAR and docking. CO4.Various strategies to develop new drug like molecules.□	PO11
	BP808ET: CELL AND MOLECULAR BIOLOGY (Elective subject) CO45	CO1 Study of cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function. CO2 Cell biology research	PO1
	BP809ET. COSMETIC SCIENCE(Theory) CO46	CO1 Deals with the study of cosmetics including their preparation, uses and effects. CO2 Also deals with their industrial aspects.	PO1
	BP810 ET. PHARMACOLOGICAL SCREENINGMETHODS CO47	CO1 Imparts the basic knowledge of preclinical studies in experimental animals. CO2. Appreciate and demonstrate the importance of biostatistics and research methodology.	PO1
	BP 811 ET. ADVANCED INSTRUMENTATION TECHNIQUES	CO1 Deals with the application of instrumental methods in qualitative and	PO1

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	CO48	quantitative analysis of drugs. CO2 Imparts advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. CO3 Emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.	
	BP 812 ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS CO49	CO1 Understands the need and requirements of dietary supplements among different groups in the population. CO2. Understand the outcome of deficiencies in dietary supplements. CO3. Appreciate the components in dietary supplements and the application.	PO12

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M.PHARM

(PHARMACEUTICS)

S.no	Name of the program	Name of the course	Course outcome	Program Outcome
1	M.Pharm	**Modern Pharmaceutical Analytical Techniques**	CO1 Develops clear insight about theoretical and practical skills of the instruments used in pharmaceutical industry. CO2 Helps in dealing with their industrial use as well as in research. CO3 Helps in interpretation of the data.	PO2,PO4
2		**Drug Delivery system**	CO1 Categorizes new drug delivery systems and formulations. CO2 Imparts a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms. CO3. Pharmaceutical calculations and Preparation of various conventional dosage forms.	PO2,PO3,PO12
3		**Modern Pharmaceutics**	CO1 Establishes process of development of ethical and quality considerations of medical devices.	PO1, PO2
4		**Regulatory Affairs**	CO1 Develops Pharmacovigilence and process of monitoring in clinical trials. CO2 Various Indian pharmaceutical Acts and Laws. CO3. The regulatory authorities and agencies governing the manufacture and sale	PO5, PO8

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			of Pharmaceuticals. CO4. The code of ethics during the pharmaceutical practice.	
5		**Molecular Pharmaceutics (Nano Tech and targeted DDS)**	CO1 Establishes knowledge of Novel drug delivery systems. CO2 Helps in understanding its use in daily life. CO3 Helps in differentiating between normal and novel drug delivery system. CO4. Understands the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation.	PO1,PO2
6		**Advanced Biopharmaceutics and pharmacokinetics**	CO1 Develops the student for designing and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. CO2 It also deals with their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein. CO3. Understands the concepts of bioavailability and bioequivalence of drug products and their significance.	PO1, PO2,PO3
7		**Computer Aided drug delivery System**	CO1 Develops Computer skills for Preclinical Development and Optimization Techniques in Pharmaceutical Formulation. CO2 This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.	PO11
8		**Cosmetics and Cosmeceuticals**	CO1 Deals with the study of cosmetics including their preparation, uses and effects. CO2 Also deals with their industrial aspects. CO3 Establishes skill of development of new combinations.	PO1, PO2

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Program Outcome

PO1: Pharmaceutical Knowledge:- Students achieve a deep knowledge regarding human body, its related diseases, analytical skills, drug molecules (Active Pharmaceutical Ingredients) along with excipients, natural drug resources, chemistry involved in API including synthesis of commonly used drugs, effect of drug on human body, toxicity and impurity profile, ADME studies of drugs (behavior of drug in human body), dosage form studies including novel approaches, designing and development of formulation stability studies, analysis etc

PO2: Research Analysis: Develops knowledge in research field to make new relevant discoveries and to identify new entities.

PO3: Design & Development of dosage forms: Describes preparation of various dosage forms that could be prepared by the pharmacy students in the pharmaceutical companies for the ease of patients and to optimize formulations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern methods usage: Create, select, and apply appropriate techniques, resources and modern methods with an understanding of the limitations and its usage. The student also learns to handle many instruments related to their studies which would help them work in a Pharmaceutical Industry, pharmacovigilance, regulatory requirements, legal processes etc.

PO6: Pharmacy and society: Pharmacist provide complete health care data and practices to the people of the society and guide them to be healthy. The student also learns drug distribution system, patient counseling, industrial laws etc. Students achieve expertise in storage and distribution of drugs with all precautions and in-depth knowledge of dose, adverse effect and other health related issues to deal with ambulatory and IPD patients in hospitals and also in public and achieve responsibility of computing profession and society.

PO7: Environment and sustainability: Locate the impact of the professional pharmacist in society and environment and make an impact of it on the people of the society.

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PO8: Ethics: Justify & apply ethical principle and commit to professional ethics and responsibilities and norms of the pharmacy practice. Student is also trained in ethical behavior with physician, nurses and other paramedical staff for protecting patient's health.

PO9: Individual and team work: Function effectively as an individual and as a member or leader in diverse teams acts as a multidisciplinary person in every context. Students will be able to demonstrate rigorous and independent thinking and encourage participatory decision making in teams.

PO10: Communication: Develops Communication effectively on pharmaceutical activities with the community and with society.

PO11: Life-long learning: Recognize the need and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change and implement those technology by gaining experience.

PO12: Social Interaction: Being a public welfare job, a pharmacist would be able to interact with the people in a better way to cure them and make them feel healthy also investigate and evaluate the general state of public health conditions and concerns and develop and apply appropriate programs of action within program content area

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Program Specific Outcome

Some of the program specific outcomes are mentioned below:

PSO 1: Prepared to implement the knowledge gained during the course of the program from pharmacology, pharmaceutics, medicinal chemistry, pharmacognosy, APHE, communication skills, pharmaceutical analysis, biotechnology, biochemistry, cosmetology and environmental studies.

PSO 2: Develops knowledge of ethical and management principle required to work in a team as well as to lead a team.

PSO 3: Achieve multidisciplinary jobs in the pharmaceutical industries in various branches and would be able to write relevant and effective project reports in multidisciplinary environment in the context of changing technologies.

PSO4 Prepares to communicate easily and effectively. Would be able to perform multitasks in multifields including pharmaceuticals & cosmetic in timebound manner. Research area would be the key element.

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