**JINNAH SINDH MEDICAL UNIVERSITY**

<table>
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<th>Spiral II</th>
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<tr>
<td><strong>MODULE TITLE</strong></td>
<td>Foundation- 2, 2021</td>
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<tr>
<td><strong>INTRODUCTION</strong></td>
<td>This module has been designed to introduce students to basic concepts essential for understanding a number of issues related to diseases process, their prevention and treatment. It is hoped that learners will be able to apply these key concepts in future, system-based modules to understand the diseases processes and their management.</td>
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<td><strong>RATIONALE</strong></td>
<td>In the 2nd spiral, before students go on to complex issues related to organ systems, it becomes necessary for them to have clear concepts underlying them. This module is designed so that it proceeds from simple to more complex basic issues. Concepts dealt with in this module will be revisited in many other modules in the future.</td>
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<tr>
<td><strong>TARGET STUDENTS</strong></td>
<td>Third year M.B.B.S., 2021</td>
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<td><strong>DURATION</strong></td>
<td>10 weeks</td>
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<td><strong>MODULE OUTCOMES</strong></td>
<td>By the end of the module, students should be able to describe main concepts from each of the disciplines taught</td>
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<tr>
<td><strong>DEPARTMENTS</strong></td>
<td>Biochemistry, Community Medicine, Forensic Medicine &amp; Toxicology, Pathology &amp; Microbiology, Pharmacology</td>
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<tr>
<td><strong>OBJECTIVES</strong></td>
<td>By the end of the module, students will be able to:</td>
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### BIOCHEMISTRY

1. **Basic concepts of genetics**
   - Discuss the basic concepts of genetics including DNA and RNA structure, Mendel’s Laws of inheritance and Pedigree Chart

2. **DNA Replication and repair**
   - Describe the process of DNA Replication and repair

3. **Transcription and Post Transcriptional Modification**
   - Explain the mechanism of Transcription and Post Transcriptional Modification

4. **Translation and Post Translational Modification**
   - Discuss the process of Translation and Post Translational Modification

### COMMUNITY MEDICINE

1. **Introduction to public health**
   - define common terminologies used in Community Medicine including C.O.M.E (Community Oriented Medical Education) & Comprehensive Health Care
   - briefly describe historical development of Public Health
   - discuss development of public health in Indo- Pakistan
   - discuss Health Plans and Social Action Program
   - discuss major Health Problems in the region and globally

2. **Concept of disease causation (determinants & iceberg):**
   - discuss the concept of disease causation
   - list determinants of disease
   - discuss iceberg phenomenon
3 Natural history of disease & Levels of prevention:
- discuss the phenomenon of natural history of disease & different levels of prevention

4 Dynamics of Disease:
- describe the dynamics of disease
- discuss direct and indirect transmission
- list factors facilitating occurrence of disease

5 International health agencies- WHO, UNICEF etc.
- list Regional Offices of WHO
- discuss functions of WHO & of UNICEF
- discuss UNICEF’s GOBI-FFF program
- Describe International Health Regulations

6 Health Care System (health system of Pakistan included):
- define District Health System and Health District.
- explain Health Systems Development
- discuss the Situation Analysis by studying Health Indicators and Health Needs.
- list the following:
  i. Health System Problems,
  ii. Public Health Engineering,
  iii. Financial and Organizational problems
  iv. problems of Health Planning, Evaluation and Research
  v. primary aims of Integrated Health
- identify Services and Resources, Health Facilities and Health Manpower.
- describe major problems of Rural and Urban Health Areas of Pakistan.
- explain Multi-sectoral Interaction and Partnership
- describe the role of District Management Team.

7 Primary Health Care:
- discuss the concept of Primary Health Care and its essential components
- describe guidelines in PHC Planning.

8 Introduction to environmental health (climate change & global warming included)
- define environmental health
- discuss epidemiological triangle
- list types of pollution and its sources

9 Nuclear medicine:
- describe the basic concepts involved in radiation process
- explain the role of nuclear medicine in medical diagnosis
- state the standard permeable dose of radiation
- describe the method of protection from radiation
- describe safe management of radioactive waste.

10 Genomics:
define genomics
- differentiate between genetics and genomics
- discuss Genotype and Phenotype
- discuss Public Health or Community Genetics
- describe the role of Public Health practitioners in Genomics

11 Introduction to demography (demographic transition included):
- define demography
- list the tools of demography
- describe Age-Sex Composition by Population Pyramid & its Importance
- explain the Four Patterns of population change
- discuss the stages of demographic transition

12 Vital Statistics:
- Discuss the role of vital statistics in health status of country.
- Describe Vital statistics registration in developing countries.
- Describe the situation of vital statistics in Pakistan.

13 Morbidity & mortality determinants:
- calculate and interpret different mortality and morbidity indicators
- describe Special Indicators – Infant and maternal mortality rates

14 Population pyramid & interpretation:
- define the concept of Population pyramid
- compare the advantages and disadvantages of population pyramid

15 Introduction to infections & control of infections:
- define the following terms: infection, infestation, infection agent, control, elimination and eradication, agent, host and environment
- discuss the role of incubation period, serial time period in control of infection.
- describe the epidemiological triangle
- differentiate between infectious and communicable diseases.
- differentiate between disinfection and sterilization.
- describe control measures for infectious & communicable diseases.
- explain the role of immune-prophylaxis & screening in the control of infection

16 Emerging & Re-emerging diseases:
- name the different emerging diseases
- describe the etiology, epidemiology, risk factors, control and prevention of emerging and re-emerging diseases

17 Disease screening & Surveillance:
- define Disease Surveillance
- discuss the Key concepts of Disease surveillance
- discuss the uses and methods of disease surveillance

18 Health Information, Education and Communication (IEC):
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<th>FORENSIC MEDICINE</th>
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<tr>
<td>• define Health Management Information System &amp; Health Education</td>
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<tr>
<td>• identify the components of Health Management Information System</td>
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<tr>
<td>• discuss the need of Health Management Information System in Primary Care Programs</td>
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<tr>
<td>• explain the important features of Health Management Information System</td>
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<tr>
<td>• explain the principles and stages of health education</td>
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<tr>
<td>• discuss health education in Pakistan</td>
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</table>

19 Waste Disposal:

- differentiate between various terminologies like refuse, sewage and sullage
- describe the various ways to collect and dispose human excreta and advise best method in given situation
- explain the water carriage system
- differentiate between sludge and sullage
- state the advantages of different types of Sewage Treatment Plants

<table>
<thead>
<tr>
<th>1. Introductory lecture</th>
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<tbody>
<tr>
<td>• Describe basics terms related to Forensic Medicine and Toxicology.</td>
</tr>
<tr>
<td>• Enumerate the branches of Forensic Sciences</td>
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<tr>
<td>• Explain the importance and utility of Forensic Medicine and its branches, in medical, legal and ethical issues</td>
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<tr>
<td>• Discuss the structure of Legal system and the powers of different courts in Pakistan</td>
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<tr>
<td>• Outline the schedule of teaching and examinations, and code of conduct in the department of Forensic Medicine and Toxicology, JSMU</td>
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<tr>
<td>• List the reference books for developing a thorough understanding of the subject</td>
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2. Legal Procedures - I

- Define important legal terms such as Summons, warrant, perjury, deposition, exhibit, offence, cognizable offence, non-cognizable offence, oath, conduct money, summons case, warrant case, bail, FIR
- Explain medical evidence and its types (oral, documentary, hearsay, circumstantial)
- List the documents prepared by a medical man (Postmortem Reports, Medico Legal Reports, Certificates such as birth certificates, death certificates, sickness certificates, certificates of unsoundness of mind)
- Differentiate Dying declaration and Dying deposition

3. Legal Procedures – II

- Enumerate the types of witnesses
- Explain the procedure of examination in the court
• List the protocols for the conduct of a doctor in the witness box, during court attendance & recording evidence and volunteering of a statement by the doctor in court of law
• Describe Professional secrecy and Privileged communication

4. Legal Procedures – III
• Explain the hierarchy of Criminal courts in Pakistan
• Define Pakistan Penal Code and Criminal Procedure Code; its execution and delivery
• List the general presumptions of law and general exemptions of law

5. Thanatology - I
• Explain the scientific concepts regarding death
• Highlight the significance of Medico-legal aspects of brain death
• Enumerate Howard’s criteria of death
• Define the terms cause, manner, mode and mechanism of death
• Describe the medico-legal aspects of sudden & unexpected deaths

6. Thanatology - II
• Explain immediate signs of death with special stress on somatic or clinical death
• Define Suspended animation
• Summarize postmortem changes in the eyes
• Describe early changes after death such as Algor Mortis (Cooling of the body), physio-chemical changes in various body tissues and organs under various environmental conditions, such as changes in muscular system after death

7. Thanatology - III
• Describe Postmortem Lividity (Livor mortis, Hypostasis or Suggilation) and its significance
• Enumerate the postmortem changes in the blood, CSF, Vitreous humor and Bone marrow

8. Thanatology - IV
At the end of the lecture, the students will be able to describe:
  i. Late signs of death i.e. Putrefaction, its mechanism, changes and gases of decomposition
  ii. Forensic entomology
  iii. Adipocere formation
  iv. Mummification

9. Thanatology - V
At the end of the lecture, the students will be able to describe:
  i. Presumption of death
  ii. Presumption of survivor-ship
iii. Certification of death according to WHO
iv. Estimation of time since death

10. Autopsy - I
   • Define autopsy and its types
   • List its aims and objectives
   • Differentiate between Medico legal and Pathological autopsy
   • Explain Autopsy protocols

11. Autopsy - II
At the end of the lecture, the students will be able to describe;
   i. External examination
   ii. Types of incisions
   iii. Techniques of autopsy
   iv. Negative and Obscure autopsy
   v. Internal examination of head

12. Autopsy - III
At the end of the lecture, the students will be able to describe;
   i. Internal examination of thoracic and abdominal cavities
   ii. Dissection of respiratory tract, heart, abdominal viscera, pelvic organs, and Spinal cord

13. Autopsy - IV
   • Describe method of preservation of viscera for chemical and histo-pathological examination
   • List the preservatives used in mortuary
   • Define Exhumation and Postmortem artifacts

14. Traumatology - I
   • Define Injury, Hurt, Wound, Assault and Battery
   • Classify Injuries
   • Describe blunt weapon injuries; Abrasions and Bruises

15. Traumatology – II
At the end of the lecture, the students will be able to explain;
   i. Lacerated wounds, types, mechanism of production and medico legal significance
   ii. Sharp weapon injuries- Incised wounds, stab wounds with medico legal significance

16. Traumatology – III
At the end of the lecture, the students will be able to summarize Qisas and Diyat Act with interpretation of injuries accordingly

17. Custodial deaths and torture
   • Enumerate deaths in custody
## Define Torture according to World Medical Association (Declaration of Tokyo)
- Explain various torture techniques
- List the sequelae of torture
- Describe the role of Medical practitioner and the ethical issues with relation to torture

### 18. Infanticide (Pediatric Forensic Medicine - I)
- Define infanticide, feticide, still born baby and dead born baby
- Discuss Maceration
- List the methods of foetal age estimation
- Summarize the signs of live birth
- Define Precipitate labor/Unconscious delivery
- List the criminal causes of death of new born babies i.e. Acts of commission and omission
- Explain autopsy on bodies of new born babies

### 19. Battered Baby (Pediatric Forensic Medicine-II)
- Explain Battered Baby Syndrome, its etiology and clinical features
- Enumerate the Injuries related to Shaken Baby Syndrome with mechanism
- Define COT death (Sudden Infant Death Syndrome) and various possibilities of death with postmortem findings, Medico legal importance of SIDS

### 20. Animal Poisons- Toxicology (Snakes And Scorpions )
- Classify snakes
- Differentiate between poisonous and non poisonous snakes
- Differentiate between Colubridae and Viperidea
- Summarize the signs and symptoms of bites by cobra and viper
- Explain the principles of treatment of snake bite and Anti-venom therapy
- List the medico legal aspects of snakebite
- Discuss the signs, symptoms and treatment of Scorpion bite

### 21. Thermal Injuries (Burns, scalds)
- Classify thermal injuries and burns
- Differentiate the types of burns.
- Calculate the surface area of burns in adults and children.
- List the causes of death due to burns.
- List the postmortem findings and artifacts due to burns.
- Differentiate ante-mortem and postmortem burning
- Differentiate burns due to dry heat, moist heat and chemicals for medico legal purposes.

### 22. Environmental (Cold/heat) trauma
By the end of the lecture, the learner will be able to describe;
### 23. Forensic Electrocution & Starvation

By the end of the lecture, the participants will be able to:
- Explain the features of injuries due to various types of electrical current.
- List the causes of death due to electrocution.
- Enumerate lightning injuries and lightning deaths.
- Describe the types, signs and symptoms and postmortem findings of starvation.

### I. GENERAL PATHOLOGY

#### CELLULAR RESPONSES TO STRESS AND TOXIC INSULTS: ADAPTATION, INJURY, AND DEATH

1. **Introduction to Pathology Overview: Cellular Responses to Stress and Noxious Stimuli**
   - Define Pathology and Pathogenesis.
   - Briefly discuss cellular responses to the injury and stages of the cellular response to stress and injurious stimuli.

2. **Adaptation of Cellular Growth and Differentiation**
   - Define adaptation, hypertrophy, hyperplasia, atrophy, and metaplasia.
   - Describe the causes and mechanism of hypertrophy, hyperplasia, atrophy, and metaplasia.

3. **Overview of Cell Injury and Cell Death**
   - List causes of cell injury.
   - Discuss morphological alterations in cell injury including both reversible and irreversible injury.

4. **Mechanism of Cell Injury and Examples**
   - Describe Mechanisms of Cell Injury including Depletion of ATP, Mitochondrial damage, Influx of Calcium, Accumulation of Oxygen derived free radicals, Defects in membrane permeability, Damage to DNA and Proteins.
   - Discuss properties of the Principal Free Radicals Involved in Cell Injury.
   - Describe the process of Autophagy.

5. **Apoptosis and Necrosis**
   - Discuss causes, morphological and biochemical changes, clinicopathologic correlations in Apoptosis.
   - Summarize the pathways of apoptosis.
6 Intracellular Accumulations
• Summarize the pathways of abnormal accumulation.
• Discuss types of pigments (exogenous and endogenous)
• Describe hyaline changes, lipid, protein, and glycogen accumulation
• Discuss briefly pathological classification of intracellular accumulations

INFLAMMATION AND REPAIR
7 Introduction to Inflammation & Acute inflammation
• Define inflammation
• Classify inflammation
• List the causes of inflammation
• Discuss the sequence of events in acute inflammatory process

8 Mediators of acute inflammation
• Name the main inflammatory mediators
• Describe their role in the inflammatory process

9 Morphological pattern & outcomes of acute inflammation
• Explain different morphological pattern of acute inflammation
• List the outcomes of acute inflammation

10 Chronic Inflammation
• Define chronic inflammation
• List the causes and morphological features of chronic inflammation
• Describe the cells and mediators & their role in chronic inflammation
• Describe the systemic effects of acute and chronic inflammation

11 Granulomatous Inflammation
• Define granulomatous inflammation
• List the types of granulomatous inflammation
• List the diseases with granulomatous inflammation
• Discuss morphology of granulomatous inflammation

12 Tissue repair
• Define tissue repair
• Describe the mechanism involved in tissue regeneration and scar formation
• List the factors that influence tissue repair

13 Healing by First & Second Intention
• Contrast repair by primary and secondary intention
• Describe the complications in tissue repair
HEMODYNAMICS AND SHOCK
14 Edema, Effusion, Hyperemia and Congestion
- Define edema, effusion, exudate, transudate, hyperemia and congestion
- Define various terminologies according to morphology of edema & effusion
- Discuss the pathophysiologic categories of edema
- Describe the mechanism & clinical significance of edema at different sites
- Describe the morphological changes in chronic passive congestion of the lungs & liver

15 Hemostasis
- Define hemostasis
- Describe the sequence of events involved in primary & secondary hemostasis including the role of platelets, endothelium & coagulation cascade
- Describe the defects of primary & secondary hemostasis

16 Thrombosis & Embolism
- Define embolus, infarction
- Describe the factors that predispose to thrombosis
- Describe the morphologic features of thrombi
- List the possible fate of thrombus
- Describe the clinical features of venous, arterial & cardiac thrombosis
- Define Disseminated Intravascular Coagulation (DIC)
- Describe the pathogenesis of DIC
- List the types of embolism
- Describe the clinical manifestations & consequences of pulmonary & systemic thromboembolism
- Discuss the clinical conditions that give rise to fat & marrow embolism, air embolism & amniotic fluid embolism
- Classify infarction
- Describe the morphologic features of red & white infarct
- List the factors that influence development of infarct
- Explain the differences between ante-partum & post-mortem clots

17 Shock
- Define shock
- List the three major types of shock
- Describe the mechanism of three major types of shock
- Discuss the factors involved in the pathophysiology of septic shock
- Describe the three stages of shock
- List the clinical features of shock

GENETICS
18 Introduction to Mendelian Disorders
- Discuss the transmission pattern of single gene disorder
- Discuss the pathogenesis of important autosomal recessive, autosomal dominant, and X-linked disorders
• List the examples of Autosomal Dominant Disorders, Autosomal Recessive Disorders.

19 Mutation
• Define mutation
• Briefly discuss principles relating to the effects of gene mutation
• Distinguish between types of mutations in the coding and non-coding regions of genes

20 Single Gene Disorders
• Define single-gene disorders
• List types of single-gene disorders on the molecular and biochemical basis
• Discuss disorders associated with defects in structural proteins (Marfan's & Ehlers-Danlos syndrome)
• Discuss disorders associated with defects in receptor proteins (Familial Hypercholesterolemia)
• Name types of lysosomal & glycogen storage diseases with their deficient enzymes

21 Chromosomal Disorders
• Define normal karyotype and common cytogenetic terminology
• Discuss structural chromosomal abnormalities
• Discuss Cytogenetic Disorders Involving Autosomes including Trisomy 21: Down Syndrome, Trisomy 18: Edwards Syndrome, Trisomy 13: Patau Syndrome
• Name diseases with deletion of genes at chromosomal locus 22q11.2 (DiGeorge syndrome, Velocardiofacial syndrome)
• Discuss Cytogenetic Disorders Involving Sex Chromosomes including Klinefelter syndrome, Turner syndrome

22 Molecular Genetic Disorders and Diagnosis
• List the indications for analysis of Inherited Genetic Alterations
• Summarise the basic principles of recombinant genetic techniques (PCR, FISH, RFLP, BLOTTING) and their applications in the detection of genetic diseases

IMMUNOLOGY
23 Introduction & Innate immunity
• Define immunity and its types
• Classify types of immunity according to their function especially innate immunity
• List the components of immune system
• Discuss the functions of immune system
• Discuss the role of T cells, B cells, natural killer cells, macrophages in immunity
• Discuss the specificity of the immune response and properties, component and pattern of recognition receptors
• Define Innate immunity
• Discuss properties, components & pattern recognition receptors.
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<th>Topic</th>
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| **24 Adaptive immunity (I)** | - Define adaptive immunity  
- Classify T cells according to its types.  
- Discuss the functions of CD4 and CD8 T cells with respect to activation, co-stimulation and memory formation  
- Discuss the effect of superantigens on T cells |
| **25 Adaptive immunity (II)** | - Define adaptive immunity  
- Discuss the mode of activation of B cells  
- Discuss effector functions of B cells  
- Define antibody  
- Discuss the structure of antibody  
- Classify antibodies according to types  
- Define primary response and secondary response of antibodies  
- Discuss the functions of antibodies |
| **26 MHC & transplantation** | - Define Major Histocompatibility Complex (MHC)  
- Classify MHC proteins according to its classes  
- Define transplantation  
- Discuss the importance of MHC in transplantation  
- Classify types of transplant rejections  
- Define allograft rejection  
- Discuss HLA typing in the lab in association with transplantation |
| **27 Complement System** | - Define complement system  
- Discuss complement system with respect to activation and regulation  
- Discuss the role of complement in immunity  
- Explain the clinical aspects of complement system |
| **28 Hypersensitivity I & II** | - Define Hypersensitivity reaction, desensitization, atopy, drug hypersensitivity  
- Classify hypersensitivity according to its types  
- Discuss the pathogenesis of types I & II hypersensitivity  
- Discuss various clinical presentations of type I & II hypersensitivity reactions  
- Discuss the treatment and prevention of types I & II hypersensitivity |
| **29 Hypersensitivity III & IV** | - Define Arthus reaction, Serum Sickness, Immune Complex Disease  
- Discuss the pathogenesis of type III & IV hypersensitivity  
- Discuss various clinical presentations of type III & IV hypersensitivity reactions  
- Discuss the treatment and prevention of type III & IV hypersensitivity  
- Discuss diagnostic immunology  
- Discuss briefly Agglutination & precipitations reactions, ELISA  
- Discuss ABO blood groups, transfusion reactions & Rh-incompatibility |
30 Tolerance and Autoimmune Disease
- Define T & B cell tolerance, autoimmunity
- Discuss the pathogenesis of autoimmune disease
- Discuss various clinical presentations of autoimmune diseases

31 Immunodeficiencies
- Define immunodeficiency
- Classify immunodeficiency according to its types
- Discuss various clinical presentations of immunodeficiency diseases

NEOPLASIA
32 Introduction to Neoplasia
- Define neoplasia
- Discuss Nomenclature of benign and malignant tumors with respect to tissue of origin
- Describe characteristic features of benign & malignant tumors

33 Gross & Microscopy of Benign & Malignant tumors
- Define Anaplasia, Metaplasia, Dysplasia, Metastasis
- Define cell Differentiation and de-differentiation
- Discuss all the components and morphological features of anaplasia
- Discuss Local Invasion of tumors
- Discuss Pathways of Spread of malignant tumors
- Compare features of Benign and Malignant Tumors

34 Epidemiology of Cancer
- Discuss the global impact of cancer
- List the Environmental Factors involved in the pathogenesis of malignancy
- Discuss different types of occupational cancers
- Define Acquired Predisposing Conditions leading to cancer development.
- Discuss association between Chronic Inflammatory States and Cancer
- Discuss the role of genetic predisposition and Interactions between Environmental and Inherited factors in cancer development

35 Molecular Basis of cancer I
- List Four classes of normal regulatory genes with respect to neoplasia
- Discuss Stepwise Accumulation of driver and passenger mutations
- Describe Cellular and Molecular Hallmarks of Cancer
- Define oncogenes
- Define Proto-oncogenes, and Oncoproteins
- Classify oncogenes according to their mode of action and associated tumors
<table>
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<th>36 Molecular Basis of cancer II</th>
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<tr>
<td>• Define Tumor Suppressor Genes</td>
</tr>
<tr>
<td>• Classify tumor suppressor genes according to their mode of action and associated tumors</td>
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<tr>
<td>• Discuss RB gene with respect to its role in tumor development</td>
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<tr>
<td>• Discuss p53 gene with respect to its role in tumor development</td>
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<th>37 Molecular Basis of cancer III</th>
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<tr>
<td>• Define the Warburg Effect and angiogenesis</td>
</tr>
<tr>
<td>• Define Evasion of Programmed Cell Death (Apoptosis)</td>
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<tr>
<td>• Discuss the Stem Cell-Like Properties of Cancer Cells</td>
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<tr>
<td>• Discuss the effect of angiogenesis on tumor progression</td>
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<td>• Discuss local Invasion and distant metastasis in neoplastic lesions</td>
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<tr>
<td>• Explain the molecular basis of Multistep-Carcinogenesis</td>
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<th>38 Grading, staging &amp; clinical effects of Neoplasia</th>
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<tbody>
<tr>
<td>• Define Grading and Staging of Tumors</td>
</tr>
<tr>
<td>• Define Cancer Cachexia</td>
</tr>
<tr>
<td>• Classify Paraneoplastic Syndromes according to their clinical effects and association with various tumors</td>
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<td>• Discuss different types of Laboratory investigations used for Diagnosis of Cancer</td>
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<th>39 Tumor markers &amp; carcinogenic agents</th>
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<tr>
<td>• Define Chemical Carcinogenesis, Radiation Carcinogenesis, Microbial Carcinogenesis</td>
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<tr>
<td>• Classify chemical and radiation carcinogens according to their types and modes of action</td>
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<tr>
<td>• Classify microbial carcinogenesis according to the Viral and Bacterial involvement</td>
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<tr>
<td>• Classify Tumor Markers according to types and mode of action</td>
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II. **GENERAL MICROBIOLOGY**

1 Introduction to Microbiology

• Define microbiology
• Differentiate between prokaryotes and eukaryotes
• Discuss the types of microorganisms according to shapes and staining.

2 Bacterial structure I

• Discuss the difference between gram-positive and gram-negative bacteria
• Discuss the essential components of bacterial structure (cell wall, plasma membrane, cytoplasm, plasmid, transposons, nucleoid, mesosomes, periplasm)
• Describe the different shapes & staining procedure for bacteria.

3 Bacterial structure II

• Describe the non-essential components of the bacterial structure (capsule, spore, pili, plasmid, flagellum, granules, glycocalyx)
<table>
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<tr>
<th>Course Title</th>
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</table>
| 4 Bacterial Genetics                                                       | • Discuss Mutations  
• Describe the process of transfer of DNA within and between bacterial cells  
• Discuss the importance of recombination                                                                                                               |
| 5 Classification of Bacteria and Normal Human Microbiome                   | • Discuss the principles of classification  
• Classify Bacteria  
• Discuss the concepts in normal microbiota of various areas of the body                                                                                     |
| 6 Pathogenesis I                                                           | • Describe the Principles of pathogenesis  
• List the types of bacterial infection  
• Explain the stages of bacterial pathogenesis  
• Discuss the determinants of bacterial pathogenesis (Transmission, adherence, invasion)                                                                  |
| 7 Pathogenesis II                                                          | • Discuss the determinants of bacterial pathogenesis, (Toxin production eg. exotoxin, endotoxin)  
• Discuss bacterial infection associated with cancer  
• Describe the stages of infectious disease  
• Describe the importance of Koch’s postulates                                                                                                             |
| 8 Host defence                                                             | • Discuss the Principles of host defence, innate immunity (skin and mucous membrane)  
• Describe the processes of Inflammatory response, phagocytosis and adaptive specific immunity                                                                 |
| 9 Sterilization and Disinfection                                           | • Discuss the principles of sterilization and disinfection  
• Describe the Chemical agents of disinfection  
• Describe the physical agents of disinfection and autoclaving  
• Discuss the role of sanitizers and disinfectants                                                                                                            |
| 10 Vaccines (Bacterial)                                                    | • Explain the principles of bacterial vaccines  
• Differentiate between active immunity and passive immunity                                                                                                     |
| VIROLOGY                                                                   | 11 Basic Virology & Classification                                                                                                                                                                                  |
|                                                                            | • Compare viruses and cells  
• Classify viruses                                                                                                                                            |
|   | • Discuss size and shape of viruses  
|   | • Discuss viruses causing epidemic and pandemic  

12 Replication  
• Describe viral growth curve  
• Describe specific events during the growth cycle and lysogeny  

13 Viral Pathogenesis & host defence  
• Describe Transmission and portal of entry of virus  
• Differentiate Pathogenesis and immunopathogenesis  
• Differentiate Nonspecific defences and specific defences  

MYCOLOGY  
14 Basic Mycology  
• Describe the structure and growth of fungi  
• Explain the pathogenesis  
• Describe fungal toxins and allergies  
• Explain Laboratory diagnoses and treatment of fungal infections  

15 Cutaneous and Subcutaneous Mycoses  
• Describe Dermatophytosis causing agents  
• Discuss the following: Tinea versicolor, Tinea nigra, Sporotrichosis, Chromomycosis and Mycetone  

16 Systemic Mycoses (Coccidioides, Histoplasma, Blastomyces, Paracoccidioides)  
• Describe the properties of fungi causing systemic fungal diseases  
• Describe the process of transmission, pathogenesis and clinical findings of these fungal infections  
• Discuss the epidemiology of these fungal infections  
• Discuss Laboratory Diagnoses and treatment of systemic mycoses  
• Explain characteristics of Opportunistic Mycoses  

PHARMACOLOGY  
1 Introduction to Pharmacology  
• Discuss the branches of Pharmacology and Therapeutics with their application  
• Define terminology of Pharmacokinetics and Dynamics  

2 Routes of drugs administration  
• Classify routes of drug administrations  
• Explain advantages and disadvantages of different routes of administration  

3 Source of drugs active principle  
• Discuss sources of drug synthesis and explain their active principles  
• Explain different types of drug doses and their effects  

4 Drug Absorption & Bioavailability& Factors  
• Discuss different processes of drug permeation through biological membranes
1. Explain drug absorption and bioavailability, and factors affecting on these both.

2. **5 Drugs Distribution, volume of Distribution & PPB**
   - Define drug distribution and Vd
   - Discuss factors affecting it
   - Explain plasma protein binding and its influence on drug distribution

3. **6 Biotransformation of drugs**
   - Describe principles of drug biotransformation, metabolic reactions, phase-I & phase-II and their catalyzing enzymes

4. **7 Biotransformation & factors affecting**
   - Explain different factors which affect the process of drug biotransformation

5. **8 Pharmacology of drugs excretion & factor affecting the excretion**
   - Define kinetics of drug excretion, routes of drug excretion and
   - Discuss factors affecting drug excretion

6. **9 Steady State Concentration and Kinetics of Drug Elimination**
   - Define drug clearance, drug elimination and half-life
   - explain kinetics of drug clearance and drug elimination.
   - Explain C_{ss} and its achievement.
   - Calculate half-life
   - Discuss the of half-life and relation with drug dosing

7. **10 Drug Receptors**
   - Explain types of drug receptors, their properties
   - Discuss different mechanisms by which we obtain the therapeutic effect of the drugs

8. **11 Mechanism of drug actions**
   - Explain modes of action of different drugs at the molecular level
   - Discuss its classification

9. **12 Dose response relationship and factors**
   - Discuss the drug dose relationships to the drug effect and their graphic presentations
   - Describe the following terms: potency, efficacy, TI.

10. **13 Adverse Drug Reactions**
    - Discuss drug side effects, toxic effects and their types with examples

11. **14 Drug-Drug Interaction**
    - Explain types of drug interactions
    - Discuss the Pharmacokinetics and Pharmacodynamics interactions; summation, potentiation, synergism, additive effects and antagonism with examples

12. **AUTONOMIC NERVOUS SYSTEM**
<table>
<thead>
<tr>
<th>15 Introduction to Autonomic Pharmacology</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Summarise the organization of the Autonomic Nervous System, its innervations, and functions, neurotransmitters and their locations.</td>
</tr>
<tr>
<td>• List receptor types and</td>
</tr>
<tr>
<td>• Discuss the effects caused by the activation of different receptors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16 Parasympathomimetic Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Summarise cholinergic nerves, their characteristics and subtypes of cholinoceptors</td>
</tr>
<tr>
<td>• Describe the classification, mode of action, clinical uses and side effects of Cholinoceptors stimulants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17 Parasympatholytic Drugs-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classify Anticholinergic drugs.</td>
</tr>
<tr>
<td>• Explain their pharmacokinetics &amp; pharmacodynamics.</td>
</tr>
<tr>
<td>• Describe organ system effects, clinical uses, side effects and contra-indications of anticholinergic drugs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>18 Parasympatholytic Drugs-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Explain the basic &amp; clinical pharmacology of Skeletal muscle relaxants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19 Sympathomimetic Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Summarise Adrenoreceptor types &amp; subtypes</td>
</tr>
<tr>
<td>• Classify the sympathomimetic drugs, clinical uses, side effects and contra-indications of those drugs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>20 Sympatholytic Drugs-1 (α-adrenergic antagonists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classify α-adrenoceptor antagonists</td>
</tr>
<tr>
<td>• Explain the pharmacokinetics and pharmacodynamics, clinical uses, side effects of α-adrenergic antagonists</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>21 Sympatholytic Drugs II (β-adrenoceptor Antagonists)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classify β-adrenoceptor Antagonists</td>
</tr>
<tr>
<td>• Explain the pharmacokinetics and dynamics, clinical uses, side effects of β-adrenergic antagonists</td>
</tr>
</tbody>
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<thead>
<tr>
<th>FORENSIC MEDICINE</th>
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</thead>
</table>

1. General Toxicology
At the end of the tutorial, the students will be able to:
• Define Toxicology
• Classify poisons based on: chief symptoms and medico legal criteria
• Explain the International toxicity rating of poisons

2. General Toxicology
At the end of the tutorial, the students will be able to:
• Define a poison.
• Differentiate between poison and a medicine.
• Explain routes of administration and excretion of poisons.
• List the factors that modify action of poisons.
• Explain the diagnosis of poisoning in living & dead
### General Toxicology
At the end of the tutorial, the students will be able to discuss the:
- Duties of a doctor in a case of suspected poisoning
- General principles of treatment of poisoning viz. Gastric lavage, Antidote therapy

### General Toxicology
At the end of the tutorial, the students will be able to discuss the role of poisoning Information Centre in treatment of cases of poisoning

### Postmortem report writing/ Autopsy Protocols
At the end of the tutorial, the students will be able to write a Postmortem Report.

### Autopsy hazards
At the end of the tutorial, the students will be able to discuss the hazards related to autopsy, and the methods to prevent these hazards.

### Traumatology
At the end of the tutorial, the students will be able to write medico-legal report of an injured person.

### Crime scene investigation
At the end of the tutorial, the students will be able to discuss the important aspects of:
- Crime scene investigation.
- Trace evidence
- Locard’s principle of exchange & its medico legal importance

### Pharmacology

#### Terms & Abbreviations used in Pharmacology
- Explain use of metric and apothecary systems of measurement in the drug preparation
- Discuss terms & abbreviations used in prescriptions

#### Dosage formed Drugs
- Discuss the clinical usage, classification and properties of different drug dosage forms

#### Standard format of prescription writing
- Discuss the importance and method of standard format of prescription writing

#### Drug-dosage calculation
- Explain the different formulas used to calculate the drug dosage
<table>
<thead>
<tr>
<th>PRACTICALS</th>
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<tbody>
<tr>
<td>JINNAH SINDH MEDICAL UNIVERSITY</td>
<td></td>
</tr>
<tr>
<td><strong>Calculate the doses of drugs for patients of different ages and weight</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parasympathomimetic &amp; Parasympatholytic Drugs</strong></td>
<td></td>
</tr>
<tr>
<td>- Predict effects of parasympathomimetic and Parasympatholytic drugs based on knowledge of classification, Pharmacokinetics &amp; Pharmacodynamics of Parasympathomimetic and -lytic drugs</td>
<td></td>
</tr>
<tr>
<td><strong>Sympathomimetic and Lytic Drugs</strong></td>
<td></td>
</tr>
<tr>
<td>- Predict effects of parasympathomimetic and Parasympatholytic drugs based on knowledge of classification, Pharmacokinetics &amp; Pharmacodynamics of Sympathomimetic and -lytic drugs</td>
<td></td>
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<tr>
<td><strong>FORENSIC MEDICINE</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>PATHOLOGY</strong></td>
<td></td>
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<tr>
<td>Cell Adaptations</td>
<td></td>
</tr>
<tr>
<td>- Differentiate among hypertrophy, hyperplasia, atrophy, metaplasia based on slides shown</td>
<td></td>
</tr>
<tr>
<td>Apoptosis and Necrosis</td>
<td></td>
</tr>
<tr>
<td>- Differentiate between necrosis and apoptosis based on the slides shown</td>
<td></td>
</tr>
<tr>
<td>- Identify morphologic changes in cell injury culminating in necrosis and apoptosis</td>
<td></td>
</tr>
<tr>
<td>- Discuss morphologically distinct patterns of necrosis including coagulative necrosis, liquefactive necrosis, gangrenous necrosis, caseous necrosis, Fat necrosis, and fibrinoid necrosis</td>
<td></td>
</tr>
<tr>
<td><strong>MICROBIOLOGY</strong></td>
<td></td>
</tr>
<tr>
<td>Use of microscope for the identification of bacteria</td>
<td></td>
</tr>
<tr>
<td>- Identify different parts of microscope</td>
<td></td>
</tr>
<tr>
<td>- Use identification of histopathological specimens and microorganisms</td>
<td></td>
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<tr>
<td>Simple staining</td>
<td></td>
</tr>
<tr>
<td>- Name different kinds of stains and staining techniques</td>
<td></td>
</tr>
<tr>
<td>- Perform simple staining</td>
<td></td>
</tr>
<tr>
<td>Gram Staining</td>
<td></td>
</tr>
<tr>
<td>- Discuss the rationale and uses of performing gram staining</td>
<td></td>
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<tr>
<td>- Perform gram staining</td>
<td></td>
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<tr>
<td>Spore staining &amp; Capsule staining</td>
<td></td>
</tr>
<tr>
<td>Motility test, Specialized structures &amp; extensions outside cell wall</td>
<td></td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>• Perform motility test</td>
<td></td>
</tr>
<tr>
<td>• Name the specialized structures &amp; extensions outside cell wall</td>
<td></td>
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</tbody>
</table>

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<thead>
<tr>
<th>Sterilization &amp; Disinfection</th>
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</thead>
<tbody>
<tr>
<td>• Identify the apparatus for Sterilization &amp; Disinfection</td>
</tr>
<tr>
<td>• Discuss the uses of various disinfectants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Catalase and Coagulase tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Perform Catalase and coagulase tests</td>
</tr>
<tr>
<td>• Discuss the importance and relevance of these tests</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Culture Media</th>
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</thead>
<tbody>
<tr>
<td>• Name the various culture media required for bacterial identification</td>
</tr>
<tr>
<td>• Discuss the properties, characteristics and relevance of various culture media</td>
</tr>
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<table>
<thead>
<tr>
<th>How to culture and perform Antibiotic Susceptibility Test (AST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Discuss the process of how to culture and perform Antibiotic susceptibility test</td>
</tr>
<tr>
<td>• Describe the importance and relevance of AST</td>
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</tbody>
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<thead>
<tr>
<th>Types of hemolysis on Blood Agar</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Describe the types of hemolysis on blood agar for identification of micro-organism</td>
</tr>
<tr>
<td>• Describe the importance and relevance of hemolysis on blood agar</td>
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</table>

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<tr>
<th>Examination of Pus, Ulcer material and skin specimens</th>
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<tr>
<td>• Discuss the process of examination of Pus, ulcer material and skin specimens</td>
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<th>Acid Fast staining</th>
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</thead>
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<tr>
<td>• Discuss the rationale and use of Acid fast staining</td>
</tr>
<tr>
<td>• Perform acid fast staining</td>
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</tbody>
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<tr>
<th>PHARMACOLOGY</th>
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</thead>
<tbody>
<tr>
<td>Preparation of Physiological Salt Solutions (Tyrode, Ringer, Kerb<code>s and De-Jalon</code>s solution)</td>
</tr>
<tr>
<td>• Demonstrate different types of Physiological Salt Solutions used in clinical practice and their composition for viability of living tissue.</td>
</tr>
<tr>
<td>• Explain the method to calculate the doses of different solutes to prepare those solutions used clinically</td>
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<tr>
<th>Preparation of ORS and 5% dextrose solution</th>
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<td>• Demonstrate different types of solutions used in clinical practice and their composition.</td>
</tr>
<tr>
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<tr>
<td><strong>JINNAH SINDH MEDICAL UNIVERSITY</strong></td>
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</tr>
<tr>
<td>• Calculate the deficit and replacement of fluid &amp; electrolytes</td>
</tr>
<tr>
<td><strong>Introduction to Power Lab System</strong></td>
</tr>
<tr>
<td>• Demonstrate various parts of the Power Lab System and</td>
</tr>
<tr>
<td>• Describe their functions to perform relevant experiments using Power Lab System</td>
</tr>
<tr>
<td><strong>Effect of drugs on Rabbit’s eye</strong></td>
</tr>
<tr>
<td>• Demonstrate the effect of given drugs (atropine, adrenaline, ephedrine and pilocarpine) on rabbit's eye</td>
</tr>
<tr>
<td><strong>INTERNAL ASSESSMENT:</strong></td>
</tr>
<tr>
<td>• Internal assessment will be according to JSMU policy. The details of internal assessment will be determined by the respective institutions.</td>
</tr>
<tr>
<td>• Internal assessment carries 20% weightage in the final, end-of-year examination.</td>
</tr>
<tr>
<td><strong>Final Examination</strong></td>
</tr>
</tbody>
</table>