



GURUGRAM UNIVERSITY, GURUGRAM

(A State Govt. University established under Haryana Act 17 of 2017)

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No. GUG/Estt./2024/ 1289

Dated : 19-7-2024

Subject: Syllabus for written test for the post of Assistant Professors advertised vide Advt. no. 38-48/2024.

Reference : The Advt. No. T-38-48/2024 vide which online applications for the post of Assistant Professor in various disciplines/ subjects were invited.

In continuation with the above referred advertisement, all candidates are hereby informed that the syllabus for the written test for the Assistant Professors in various disciplines/subjects are as follows:-

S.No.	Discipline/Subject	Syllabus
1	Pharmaceutical Sciences	As per latest GPAT
2	Management / Law/Communication Skill/Economics	As per latest UGC NET
3	Physics/Chemistry/Mathematics	As per latest CSIR NET
4	Computer Science & Engg.	As per latest GATE
5	Physiotherapy	Attached at annexure- A
6	VLSI Design & Tech.	Attached at annexure- B

Further it is informed that the Written test is the component of the selection criteria mandatory to qualify i.e. to secure a minimum of 50% marks (47.5% for SC/BC/PwBD category). As per condition laid down in the important instruction of the advertisement, all applicants will be allowed to appear in the written test without ascertaining the eligibility. Only those applicants who qualify the written test will be scrutinized for eligibility. Only eligible and test-qualified applicants will be considered for shortlisting for further process. The written test will comprise of 50 multiple choice questions having one and only one correct option which are to be attempted in one hour. **There will negative marking of 0.25 for each incorrect answer.**

The schedule of written test will be notified in due course. All the applicants are advised to keep visiting University website for updates, if any.


REGISTRAR

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SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN PHYSIOTHERAPY**Cardio Throacic & Pulmonary Conditions**

1. Cardio-pulmonary assessment

i) History taking ii) Observation iii) Palpation iv) Auscultation v) Percussion vi) Functional ability

2. Relevant diagnosis tests (for practical knowledge only)

i) Hematology ii) ABG analysis iii) Spirometry iv) Invasive and Non-invasive techniques v) ECG vi) Echocardiography vii) Imaging • Plain X-ray • Computed Tomography • Magnetic resonance imaging viii) Cardiac catheterization ix) Radio nuclide Scanning x) Stress testing xi) Lung Function Testing xii) Biofeedback xiii) Humidification and Aerosol Therapy.

CARDIOLOGY i) Assessment of system of heart disease. ii) Disorders of cardiac rate rhythm and conduction. iii) Cardiac Arrest Course Code Subject MPT 03 Physiotherapy management of cardiopulmonary conditions. iv) Shock v) Rheumatic fever vi) Congenital Heart Values vi) Disease of Heart Values ix) Infective endocarditis x) Ischemic heart disease xi) Hypertension xii) Orthostatic hypertension xiii) C.P.R xiv) Pericarditis xv) Heart disease in pregnancy xvi) Inflammatory arterial disease xvii) Raynaud's Disease xviii) Venous Thrombosis xix) Peripheral Vascular Disease xx) Cardiomyopathy xxi) Disease of the pericardium

PULMONOLOGY i. Obstructive Pulmonary Disease ii. Infections of the respiratory System iii. Interstitial and Infiltrative Pulmonary Diseases. iv. Pulmonary Disease due to Exposure to Organic and Inorganic Pollutants v. Pulmonary Disorders due to Systemic Inflammatory disease vi. Pulmonary Vascular disease vii. Disease of the Pleura viii. Respiratory Failure ix. Supplementary Oxygen and Oxygen Delivery in chronic Respiratory disease x. Neuromuscular Atrophic, Poliomyelitis, Motor Neuron Disease, Kyphoscoliosis Pectus carinatum, Pectus Excavatum xi. Pathophysiology of Paralytic-Restrictive Pulmonary Syndromes xii. Conventional Approaches to Managing Neuromuscular Ventilatory Failure xiii. Mechanical Ventilation: Concepts, Physiological effects and Complications

CARDIOTHORACIC SURGERIES

1. Closed versus open Heart Surgeries 2 Incisions 3 Preoperative Assessment of Patients 4 Pre and Post-Operative Blood Exchange 5 Hemodynamics Performance of Patient 6 Emergencies in CTVS 7 AV Shunts 8 Heart Transplant 9 Left Ventricular Assistive Devices 10 Procedure on Sternum, Chest wall Diaphragm, Mediastinum and Esophagus 11 Cardiopulmonary Bypass 12 Maintaining and Removing Artificial Airways 13 All Pulmonary Surgeries like Lobectomy, Pneumonectomy Pleurectomy, Thoracotomy etc.

General PT

1) Exercise Therapy

i. Assessment techniques: Manual Muscle Testing and Goniometry. ii. Stretching and Mobilization. iii. Re-education and strengthening. iv. Balance and Coordination Ex. v. Gait Analysis and Training (Both Normal and Pathological Gaits) vi. Relaxation and soft Tissue Manipulations. vii. Posture. viii. PNF and Neuromuscular Coordination ix. Hydrotherapy. x. Joint Mobilization

2) Electro-Therapy

i. General Review of Low, Med and high currents and their modifications like Di-dynamic and Russian Currents etc. ii. Laser iii. Cryotherapy iv. UVR and IRR v. Other thermal modalities like SWD, MWD, HydroCollator, Wax therapy Fluido-therapy.

Fundamental Mechanics

• Forces; composition and resolution of forces; force systems • Force of gravity and COG • Stability • Reaction forces • Friction • Moments • Newton's laws • Equilibrium: static and dynamic • Simple machines: Levers, pulleys and wheel and axle • Segmental dimensions • Poisson's effect • Static and cyclic load behaviors • Load: Load sharing and load transfer

2. Kinematics

i. Motion : types , location , magnitude and Direction ii. Angular motion and its various parameters iii. Linear motion and its various parameters iv. Projectile motion

3. Muscle Mechanics

i. Structure and composition of muscle ii. Fiber length and cross-section areas iii. Mechanical properties iv. EMG changes during fatigue v. Changes in mechanical properties because of aging, exercise and immobilization vi. Clinical application Ligament and Tendon mechanics:
 ❖ Structure, composition and mechanical properties ❖ Cross-sectional area measurement ❖ Muscle tendon properties ❖ Temperature sensitivity ❖ Changes in mechanical properties because of ageing, exercise and immobilization ❖ Mechanoreceptors ❖ Clinical application

4. Bone Mechanics:

❖ Structure and composition of bone ❖ Stress ❖ Strain ❖ Modulus of Rigidity & Modulus of elasticity ❖ Mechanical properties of Trabecular system ❖ Mechanical properties of cortical bone ❖ Bone Remodeling ❖ Response of bone to aging & exercise & immobilization ❖ Mechanics to prevent fracture in bone ❖ Clinical application.

5. Joint Mechanics

❖ Joint design ❖ Joint categories ❖ Joint Functions: Arthrokinematics, Osteokinematics and kinematics chains ❖ Joint forces, equilibrium and distribution of these forces ❖ Degenerative changes in weight bearing joints and compensatory actions ❖ Joint stability and mechanisms ❖ Clinical applications.

7. Measurement Instruments

❖ Photo- optical devices ❖ Pressure transducers and Force Plates ❖ Gait Analyzer ❖ Isokinetic device ❖ EMG (Electro physiology of muscle contraction, recording, processing) ❖ Relationship between EMG and Biomechanical Variables

8. Mechanical energy, Work and power

• Definitions • Positive and negative muscles work • Muscle mechanical power

Orthopaedics

1. Orthopedic Assessment > Patient History > Observation > Examination-Active and Passive Movements, functional Assessment, Special Tests, Reflexes and Cutaneous Distribution, Joint Play Movements Palpation > Gait-Definitions, Gait Cycle, Abnormal Gait patterns > Posture-Normal and Abnormal, Spinal Deformities > Disability Evaluation > Assessment of Amputees > Examination and Assessment of Geriatric patient.

2. Regional Examination with Special Emphasis on Special Test: > Head and Face > Cervical Spine > Shoulder > Elbow > Forearm, Wrist and Hand > Thoracic Spine > Lumbar Spine > Pelvis > Hip > Knee > Lower Leg, Ankle and foot.

3. Orthopedic Diagnosis (for Practical Purposes only) > Biomechanical measurements –Limbs and Spine > Hematology and serology > Biopsy > Plain Radiography > Contrast Radiography > Myelography > Radioactive Scanning > Discography > Tomography > Magnetic Resonance Imaging > Arthroscopy > Electromyography, Nerve Conduction Velocity, Strength Duration Curve > BMO- Bone Densitometry- Ultrasound Densitometer and Dual Energy X-ray Absorptiometry (DEXA) 2. Differential Diagnosis in different cardiopulmonary conditions.

4. General Orthopedics i. Infection Disorders of the Bones and Joints ii. Metabolic Disorders of the bones and joints iii. Congenital Disorders of the bones and joints iv. Inflammation of the bones and joints v. Degeneration of the bones and joints vi. Developmental of the bones and joints vii. Connective tissue Disorders viii. Neuromuscular disorders xi. Tumors of bones x. Complex Regional Pain Syndrome xi. Myopathies xii. Burns

Sports

Emergency sports evaluation, biomechanics of running and jumping, medical problems of athletes, female athletic triad, emergency care athletes first aid and cardiopulmonary resuscitation, sports specific injury pattern -cricket, tennis, football, sports injuries to lower Limb, spine, internal and external bleeding, role of physical exercise in high blood pressure & diabetic athlete, bio-mechanic and injury to cricket, Judo, tennis badminton, swimming, Cyriax mobilization technique for peripheral joints and spine, capsular stretching, principle of Pilates, structural and functional adaptations to resistance training, environmental stress on exercise performance- medium and high altitude, thermal stress, energy expenditure during walking running and swimming.

Rehabilitation

1 Congenital and hereditary disorders

2 Head Injury.

i) Comatose patient ii) Closed skull fractures iii) Hematomas, subdural, epidural and intracerebral iv) Open cranio- cerebral injuries v) Reconstruction operations in head injuries

3 Disorders of spinal cord and cauda equine

• Acute traumatic injuries • Haematomyelia and acute central cervical cord injuries • Slow progressive compression of the spinal cord • Syringomyelia • Ischemia and infraction of the spinal cord and cauda • Spina bafida

4 Disorders of cranial nerves

5 Disorders of peripheral nerves • Peripheral Neuropathies

• Causalgia • Reflex sympathetic dystrophy • Irradiation neuropathy • Peripheral nerves tumors • Traumatic, compressive and ischemic neuropathy • Spinal radiculitis and radiculopathy • Hereditary motor and sensory neuropathy.

SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN VLSI DESIGN & TECHNOLOGY

Device Physics: Semiconductor basics and crystal structure, Energy bands in crystalline solids, intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors. Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations, Device modelling. Properties of Silicon, SiO₂, Silicon nitrides, polysilicon, metal/oxide semiconductors interfaces, interconnect, insulators, isolators. P-N junctions, hetero junctions, Metal Semiconductor Contacts, Breakdown diodes, BJTs, MOS CAPs, MOSFETs, non-conventional FETs, LEDs, photodiodes and solar cells.

Circuits: BJT and MOSFET amplifiers: biasing, ac coupling. Current mirrors and differential amplifiers. Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators. **Combinational circuits:** Number representations, Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates, CMOS inverters and their static/dynamic CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders. **Sequential circuits:** latches and flip-flops, counters, shift registers, finite state machines, propagation delay, setup and hold time, critical path delay. Data converters: sample and hold circuits, ADCs and DACs. Semiconductor memories (Volatile and Non-Volatile): ROM, SRAM, DRAM. **Microprocessors (8085-86) and Microcontrollers (8051, Arduino, ARM):** Architecture, addressing modes, pipelining, instructions, interrupts, programming and I/O interfacing.

Fabrication Processes & Technology: Clean rooms, Crystal growth, Wafer fabrication. Wafer Cleaning/Dicing/Handling/Characterization, Oxidation, epitaxy, Lithography, Advanced lithography, Masks, Resists, Diffusion, Ion Implantation, Vacuum technology, Thin film depositions, Etching, Metallization, Multi-level metalization, interconnect and vias, bonding, MOSFET & CMOS Process flow, backend technology, and IC packaging. Process models and TCAD for IC fabrication processes. Measurement and characterization methods: Morphological, Electrical, Chemical and Mechanical. **CMOS Technology:** Moores Law, MOSFET scaling and technology trends.

Integrated Circuit Design: Introduction to VLSI Design: Top Down and Bottom-up approach, Design flow, Overview/Evolution of VLSI technology/ICs and its applications, Design methodologies, Layout design rules and abstraction levels. **Digital Design:** CMOS Inverters, Combinational and sequential logic design, Arithmetic circuits and data path design, Finite State Machine (FSM) design, Memory design. **Analog Design:** Basic concepts of analog circuits, Analog CMOS circuits, Operational amplifiers and feedback circuits, Analog-to-Digital and Digital-to-Analog converters, Radio-frequency (RF) and mixed-signal integrated circuit design, circuit simulators.

Advanced VLSI Design Techniques: Low power design techniques, Clock and power distribution networks, Digital System Testing and Fault Simulation, Design for testability (DFT) and Built-In Self-Test (BIST), Embedded System Design, System on chip, RF Microelectronics, Digital Signal Processing in VLSI, Hardware description languages (HDLs: VHDL, Verilog, System Verilog) different modelling styles, data types, objects, Dataflow, Behavioral and Structural Modeling, Simulation and synthesis. HDLs constructs and codes for combinational and sequential circuits.

ASIC Design Methodologies: ASIC design flow, RTL design and synthesis, Static Timing Analysis (STA) and timing closure, clock skew, Physical design and layout considerations. **Field-Programmable Gate Arrays (FPGAs),** FPGA architecture and programming, High-level synthesis (HLS) and FPGA design flow, FPGA-based prototyping and verification.

Emerging Trends in VLSI: Multi-core processors, Advanced CMOS technologies:(FinFETs, PD, FD-SOI, HEMT), Nanoelectronics, III-V/2D semiconductor FETs, High- κ , MEMS, NEMS, Low dimensional semiconductor devices – quantum wells, quantum wires, quantum dots. Three-dimensional integrated circuits (3D ICs), Neuromorphic and quantum computing concepts. IC Packaging, TCAD, ECAD and EDA simulation tools in VLSI, Computational techniques, and VLSI design challenges.

Communications, Networks, Signals and Systems: Analog & Digital communications, Circuit analysis, Continuous-time signals, Discrete-time signals, LTI systems.