FACULTY OF MEDICAL & ALLIED SCIENCES

SYLLABUS

FOR

B.Sc. in RADIOLOGY IMAGING & TECHNOLOGY

(SEMESTER: I-II)

(Under Choice based Credit System)

Examinations: 2021 Onwards

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY KAPURTHALA

Note:

(i) Subject to change in the syllabi at any time. Please visit the University website time to time.

IK Gujral Punjab Technical University

VISION

To be an institution of excellence in the domain of higher technical education that serves as the fountainhead for nurturing the future leaders of technology and techno-innovation responsible for the techno-economic, social, cultural and environmental prosperity of the people of the State of Punjab, the Nation and the World.

MISSION

To provide seamless education through the pioneering use of technology, in partnership with industry and society with a view to promote research, discovery and entrepreneurship

and

To prepare its students to be responsible citizens of the world and the leaders of technology and techno-innovation of the 21st Century by developing in them the desirable knowledge, skill and attitudes base for the world of work and by instilling in them a culture for seamlessness in all facets of life.

OBJECTIVES

To offer globally-relevant, industry-linked, research-focused, technology- enabled seamless education at the graduate, postgraduate and research levels in various areas of engineering & technology and applied sciences keeping in mind that the manpower so spawned is excellent in quality, is relevant to the global technological needs, is motivated to give its best and is committed to the growth of the Nation;

To foster the creation of new and relevant technologies and to transfer them to industry for effective utilization;

To participate in the planning and solving of engineering and managerial problems of relevance to global industry and to society at large by conducting basic and applied research in the areas of technologies. To develop and conduct continuing education programmes for practicing engineers and managers with a view to update their fundamental knowledge base and problem-solving capabilities in the various areas of core competence of the University;

To develop strong collaborative and cooperative links with private and public sector industries and government user departments through various avenues such as undertaking

of consultancy projects, conducting of collaborative applied research projects, manpower development programmes in cutting-edge areas of technology, etc;

To develop comprehensive linkages with premier academic and research institutions within the country and abroad for mutual benefit;

To provide leadership in laboratory planning and in the development of instructional resource material in the conventional as well as in the audio- visual, the video and computer-based modes;

To develop programmes for faculty growth and development both for its own faculty as well as for the faculty of other engineering and technology institutions;

To anticipate the global technological needs and to plan and prepare to cater to them;

To interact and participate with the community/society at large with a view to inculcate in them a feel for scientific and technological thought and endeavour; and

To actively participate in the technological development of the State of Punjab through the undertaking of community development programmes including training and education programmes catering to the needs of the unorganized sector as well as that of the economically and socially weaker sections of society.

ACADEMIC PHILOSOPHY

The philosophy of the education to be imparted at the University is to awaken the **"deepest potential"** of its students as holistic human beings by nurturing qualities of self-confidence, courage, integrity, maturity, versatility of mind as well as a capacity to face the challenges of tomorrow so as to enable them to serve humanity and its highest values in the best possible way.

SCHEME OF THE PROGRAM:

Semester-I

Sr. No.	Course Code	Course Type	Course Title	L-T-P*	Credits	Marks Distribution		Marks
						Internal	External	
1.	BRIT-101-21	Core Theory	Basics of Anatomy-I	3-1-0	4	40	60	100
2.	BRIT-102-21	Core Theory	Basics of Physiology-I	3-1-0	4	40	60	100
3.	BRIT-103-21	Core Theory	Radiographic Photography-I	3-1-0	4	40	60	100
4.	BRIT-104-21	Core Practical/Lab	Basics of Anatomy-I Practical	0-0-4	2	60	40	100
5.	BRIT-105-21	Core Practical/Lab	Basics of Physiology-I Practical	0-0-4	2	60	40	100
6.	BRIT-106-21	Core Practical/Lab	Radiographic Photography Practical	0-0-4	2	60	40	100
7.	BTHU 103-18	Ability Enhancement Compulsory Course (AECC)-I	English	1-0-0	1	40	60	100
8.	BTHU 104-18	Ability Enhancement Compulsory Course-(AECC)	English Practical/Laboratory	0-0-2	1	30	20	50
9.	HVPE-101-18	Ability Enhancement Compulsory Course-(AECC)	Human Values, De-addiction & Traffic Rules	3-0-0	3	40	60	100
10.	HVPE-102-18	Ability Enhancement Compulsory Course-(AECC)	Human Values, De-addiction & Traffic Rules (Lab/Seminar)	0-0-1	1	25	--**	25
11.	BMPD 102-18		Mentoring & Professional Development	0-0-1	1	25	--**	25
		Total		13-3-16	25	460	440	900

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

**The Human Values, De-addiction and Traffic Rules (Lab/ Seminar) and Mentoring and Professional Development course will have internal evaluation only.

Semester-II

Sr. No.	Course Code	Course Type	Course Title	L-T-P*	Credits	Marks Distribution		Marks
						Internal	External	
1.	BRIT-201-21	Core Theory	Basics of Anatomy-II	3-1-0	4	40	60	100
2.	BRIT-202-21	Core Theory	Basics of Physiology-II	3-1-0	4	40	60	100
3.	BRIT-203-21	Core Theory	Radiology graphic Photography-II	3-1-0	4	40	60	100
4.	BRIT-204-21	Core Practical/Lab	Basics of Anatomy-II Practical	0-0-4	2	60	40	100
5.	BRIT-205-21	Core Practical/Lab	Basics of Physiology-II Practical	0-0-4	2	60	40	100
6.	BRIT-206-21	Core Practical/Lab	Radiology graphic Photography-II Practical	0-0-4	2	60	40	100
7.	EVS102-18	Ability Enhancement Compulsory Course (AECC)-III	Environmental Studies	2-0-0	2	40	60	100
8.	BMPD 202-18		Mentoring & Professional Development	0-0-1	1	25	--	25
		Total		11-3-13	25	365	360	725

*A course can either have four Hrs Lecture or Three Hrs Lecture + One Hrs Tutorial as per requirement

EXAMINATION AND EVALUATION

THEORY					
S.No.			Weightage in Marks		Remarks
1	Internal Evaluation	Mid-Semester Examination	30	10	MSTs, Quizzes, assignments, attendance, etc. Constitute internal evaluation. Best of two mid-semester exams will be considered for evaluation
2		Attendance	5	5	
3		Assignments	5	5	
4	External Evaluation	End-Semester Examination	60	30	Conduct and checking of the answer sheets will be at the university level.
	Total		**100**	**50**	
PRACTICAL					
1	Internal Evaluation	Daily evaluation of practical performance/ record/ viva voce	15		
2		Attendance	5		
3		Internal Practical Examination	10		
4	External Evaluation	Final Practical Examination	20		
		Total	**50**		

PATTERN OF END-SEMESTER EXAMINATION

I. **Part A** will be One Compulsory question consisting of short answer type questions [Q No. 1(a-h)] covering whole syllabus. There will be no choice in this question. It will be of 16 marks comprising of **8 questions of 2 marks each**.

II. **Part B** will be comprising of eight questions [2-9]. Student will have to attempt any six questions from this part. It will be of 24 marks with **6 questions of 4 marks each**.

III. **Part C** will be comprising of two compulsory questions with internal choice in both these questions [10-11]. It will be of 20 marks with **2 questions of 10 marks each**.

SYLLABUS OF THE PROGRAM

The syllabus has been upgraded as per provision of the UGC module and demand of the academic environment. The contents of the syllabus have been duly arranged unit wise and included in such a manner so that due importance is given to requisite intellectual and laboratory skills. The application part of the respective contents has been appropriately emphasized.

SEMESTER-I

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-101-21**			
Subject Title:	**Basics of Anatomy-I**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	To teach the fundamental concepts of Human Anatomy			

Details of the Course (Human Anatomy)

Unit	Contents	Contact Hours
I	Introduction: Definition of anatomy and its divisions, Terms of location, positions and planes. • Cell and its organelles, Tissues & its classification, Glands. Gastro-intestinal System: Parts of GIT, structure of tongue, pharynx, salivary glands, Location & Gross structure of Oesophagus, stomach, intestine (small and large), liver, gall bladder, pancreas, spleen.	
II	Cardiovascular System: Arteries & veins, Capillaries & arterioles, Heart-size, location, chambers, blood supply of heart, pericardium, Systemic & pulmonary circulation, Major blood vessels of Heart- Aorta, pulmonary artery, common carotid artery, subclavian artery, axillary artery, brachial artery, common iliac artery, femoral artery, Inferior vena cava, portal circulation, great saphenous vein.	
III	Lymphatic System: Lymph & Lymph vessels, Structure of lymph node, names of regional lymphatics, auxiliary and inguinal lymph, nodes. Respiratory system: Parts of Respiratory system; Structure of nose, nasal cavity, larynx, trachea, lungs, pleura, bronchopulmonary segments.	
IV	Musculoskeletal system: Structure of Bone & its types, Joints-Classification of joints with examples; details of synovial joint, Bones & joints of upper limb, lower limb and their movements, Axial skeleton & appendicular skeleton, Skull, spine & its movements, intervertebral disc, Muscles & its types, Muscles of the upper limb, lower limb, trunk and neck.	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,Guyton and John.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-102-21**			
Subject Title:	**Basics of Physiology-I**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	To teach the fundamental concepts of Human Physiology			

Details of the Course (Human Physiology)

Unit	Contents	Contact Hours
I	Gastrointestinal System: Physiological Anatomy, functions of GIT, Salivary Gland-functions of saliva, Stomach- structure and functions, Gastric secretions-composition, functions, Mechanism, Pancreas-structure, functions, composition of Pancreatic juice, Liver-Functions of liver, Bile-Composition, functions, Jaundice-Types and its causes, Gall Bladder- Functions, Intestine- Movements of small and large intestine, Digestion and Absorption of Carbohydrates, Protiens, Fats, Hormones of GIT- Functions of Gastrin, Secretin, CCK-PZ.	
II	Respiratory System: Physiological Anatomy, Functions of the respiratory system, Types of respiration, respiratory membrane, Lung volumes and capacities, vital capacity and factors affecting it, Transport of Oxygen-Forms of transportation, Oxy-hemoglobin dissociation curve and factors affecting it, Transport of Carbon-Dioxide- Forms of transportation, Hypoxia-Definition, types, effects of hypoxia, Cyanosis-Definition and types, Artificial Respiration- CPR	
III	Cardiovascular System: Heart-Physiological Anatomy, Nerve supply, Properties of cardiac muscle, Cardiac Cycle-Events –systole, diastole, Cardiac Output-Definition and factors affecting it, Heart sounds-normal heart sounds, its causes, areas of auscultations, Blood Pressure-Definition, normal value, Physiological variations, its measurement, ECG- normal waves, Shock-Definition, Types.	
IV	Blood: Red Blood Cells- Functions, count, Physiological variations. Erythropoisis-stages, Hemoglobin-Functions, Physiological variations, White Blood cells-Functions, count, morphology, Platelets-count, morphology, functions. Hemostasis-Definition, Mechanism, clotting factors, Blood groups-ABO system, Rh system, Blood transfusion-Indication, transfusion reactions, Anaemias-classification, morphological and Etiological, effects of anaemia on body.	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-103-21**			
Subject Title:	**Radiographic Photography-I**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	**To teach the fundamental concepts of Radiography.**			

Unit	Contents	Contact Hours
I	The photographic process: Introduction, visible light, images produced by radiation, light sensitive photographic materials. Image characteristic: Real and mental images, reflected, transmitted and emitted light images Photographic emulsions. The photographic latent image. Positive process. Film materials in X-ray departments, history, structure of an xray film, single and double emulsion films, types of films, cross over effect. Spectral sensitivity of film material, graininess of film material, speed and contrast of photographic materials.	
II	Sensitometry: Photographic density, characteristic curves, features of the characteristic curve. Variation in the characteristic curve with the development. Comparison of emulsions by their characteristic curves. Information from the characteristic curve. The storage of film materials and Radiologygraph; Storage of unprocessed films, storing of Radiologygraphs-expiry date, shelflife, storage condition, stock control.Intensifying screens and cassettes. Luminescence: fluorescence and phosphorescence. Construction of an intensifying screen.The fluorescent materials. Types of intensifying screens, intensification factor. The influence of KV, scattered radiation. Detail, sharpness and speed , size of the crystals, reciprocity failure, quantum mottle.	
III	Cassette design, care of cassettes, types of cassettes, mounting of	

	intensifying screens, loading and unloading of cassettes. Care of intensifying screens, tests to check screen film contact and light leakage.Film processing: Development. The nature of development-manual or automatic. The PH scale. The constitution of developing solutions both in manual and automatic processing and properties of developing chemicals.The development time, factors in the use of a developer, developer activity.	
IV	Film processing: fixing and role of a fixing solution. Constitution of the fixing solutions and properties of the constituents.Fixer used in automatic processors. Factors affecting the use of the fixer.Regeneration of fixing solution. Silver recovery from waste fixer or from scrap film and its various methods.Rinsing, washing and drying. Objects of rinsing and washing, methods employed. Methods of drying films.	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	DR.S.K.BHARGAVA	RADIOLOGY FOR RESIDENTS AND TECHNICIANS	CBS
2	K THAYALAN	THE PHYSICS OF RADIOLOGY AND IMAGING	
3	Fred. A. Mettler Jr.	Essentials of Radiology	Elsevier
4	DR.BUSHAN N LAKHAR	RADIOLOGICAL PROCEDURES	ARYAN

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-104-21**			
Subject Title:	**Basics of Anatomy-I Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Human Anatomy			

Sr. No.	**Contents**	**Contact Hours**
I	**Histology: • Epithelium: Simple (squamous, cuboidal, columnar, ciliated), Stratified, Transitional • Bone, muscles (skeletal, smooth, cardiac) • Cartilage (hyaline, elastic, fibro cartilage). • Connective Tissue (loose and dense). • Arteries (large & medium sized), Veins.** • **Demonstration of various parts of body** • **Demonstration of tissues of body** • **Demonstration of parts of digestive system** • **Demonstration of parts of respiratory system** • **Demonstration of parts of skin** • **Demonstration of various parts of circulatory system (Demonstration from models)** • **Demonstration of structural differences between skeletal, smooth and cardiac muscles (permanent mounts)** • **Demonstration of various bones and joints** • **To study circulatory system from charts and transverse section (TS) of artery and vein from permanent slides.** • **To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.** • **To study various body fluids.** **Note: Demonstrations can be done with the help of models, charts and histological slides**	

Reference Books

S.No.	**Author(s)**	**Title of the Book**	**Publisher/Year**
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY

3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C, GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-105-21**			
Subject Title:	**Basics of Physiology-I Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Human Physiology			

Sr. No.	**Contents**	**Contact Hours**
I	**Examination of blood film for various blood cells from stained slides 9. Blood pressure estimation** **Estimation of Hemoglobin Concentration** **- Determination of Bleeding Time and Clotting Time** **- Determination of Blood Groups** **- Recording of normal Blood Pressure** **- Clinical Examination of Arterial Pulse** **- Determination of Vital Capacity**	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-106-21**			
Subject Title:	**Radiographic Photography Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Radiography & Imaging Technology			

Sr. No.	**Contents**	**Contact Hours**
I	(i) Test to check the x-ray films and screen contract in the cassette and **(ii)** To test to check light leakage in the cassette.	

Reference Books

S.No.	**Author(s)**	**Title of the Book**	**Publisher/Year**
1	DR.S.K.BHARGAVA	RADIOLOGY FOR RESIDENTS AND TECHNICIANS	CBS
2	K THAYALAN	THE PHYSICS OF RADIOLOGY AND IMAGING	
3	Fred. A. Mettler Jr.	Essentials of Radiology	Elsevier
4	DR.BUSHAN N LAKHAR	RADIOLOGICAL PROCEDURES	ARYAN

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BTHU101-18**			
Subject Title:	**English**			
Contact Hours:	**L:1**	**T:0**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	**To learn effective communication both oral & written.**			

Unit	Contents	Contact Hours
I	Theory of Communication Types and modes of Communication	
II	Language of Communication Verbal and Non-verbal (Spoken & verbal), Personal, Social and Business Barriers and Strategies, Intra-personal, Inter-personal and Group communication	
III	**Reading and Understanding** Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation(from Hindi/Punjabi to English and vice-versa), Literary/Knowledge Texts	
IV	Documenting, Report Writing, Making Notes, Letter Writing	

Reference Books

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. *Language, Literature and Creativity*, Orient Blackswan, 2013.
4. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas
5. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
6. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BTHU102-18**			
Subject Title:	**English Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	**To learn effective communication both oral & written.**			

Sr. No.	Contents	Contact Hours
I	**Interactive practice sessions in Language Lab on Oral Communication** Listening Comprehension Self Introduction, Group Discussion and Role Play Common Everyday Situations: Conversations and Dialogues Communication at Workplace Interviews Formal Presentations, Effective Communication/ Mis-communication Public Speaking	

Reference Books

1. *Fluency in English* - Part II, Oxford University Press, 2006.
2. *Business English*, Pearson, 2008.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
5. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**HVPE-101-18**			
Subject Title:	**Human Values, De-addiction & Traffic Rules**			
Contact Hours:	**L:3**	**T:0**	**P:0**	**Credits:3**
Examination Duration (hours)	**3**			
Objective(s):	**To develop a sense of social responsibility, traffic rules and about menace of drugs.**			

Unit	Contents	Contact Hours
I	**Course Introduction – Need, Basic Guidelines, Content and Process for Value Education** Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? – its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facilities- the basic requirements for 17ulfilment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to 17ulfil the above human aspirations: understanding and living in harmony at various levels	
II	**Understanding Harmony in the Human Being – Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' – *Sukh* and *Suvidha* Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure *Sanyam* and *Swasthya* Practice Exercises and Case Studies will be taken up in Practice Sessions.	
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship; meaning of *Nyaya* and program for its 17ulfilment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship Understanding the meaning of *Vishwas*; Difference between intention and competence	

	Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj),* Universal Order (*SarvabhaumVyawastha)*- from family to world family! Practice Exercises and Case Studies will be taken up in Practice Sessions	
IV	**Understanding Harmony in the Nature and Existence – Whole existence as Co-existence** Understanding the harmony in the Nature Interconnectedness and mutual 18ulfilment among the four orders of nature-recyclability and self-regulation in nature Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence Practice Exercises and Case Studies will be taken up in Practice Sessions.	
V	**Implications of the above Holistic Understanding of Harmony on Professional** Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations	

Reference Books

Text Book

R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Value Education*.

Reference Books

1. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991

5. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.
7. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth*
– *Club of Rome's report*, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers* , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, *Engineering Ethics (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management*, Excel Books.
12. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, *http://uhv.ac.in*

2. Story of Stuff, *http://www.storyofstuff.com*

3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA

4. Charlie Chaplin, *Modern Times*, United Artists, USA

5. IIT Delhi, *Modern Technology – the Untold Story*

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**HVPE102-18**			
Subject Title:	**Human Values, De-addiction & Traffic Rules Lab/Seminar**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	**To develop a sense of social responsibility, traffic rules and about menace of drugs.**			

Sr. No.	Contents	Contact Hours
I	One each seminar will be organized on Drug De-addiction and Traffic Rules. Eminent scholar and experts of the subject will be called for the Seminar atleast once during the semester. It will be binding for all the students to attend the seminar	

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BMPD 102-18**			
Subject Title:	**Mentoring & Professional Development**			
Contact Hours:	**L:0**	**T:0**	**P:1**	**Credits:1**
Examination Duration (hours)	**3**			
Objective(s):	**To learn the life long learning skills.**			

Sr. No.	**Contents**	**Contact Hours**
I	**Part-A (Class Activities)** 1. Expert and video lectures 2. Aptitude Test 3. Group Discussion 4. Quiz (General/Technical) 5. Presentations by the students 6. Team building Exercises 7* A part of above six points practicals on Fundamentals of Computers are also added as per Annexure-I	
II	**Part-B (Outdoor Activities)** 1. Sports/NSS/NCC 2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.	

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.

SEMESTER-II

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging &Technology**			
Subject Code:	**BRIT-201-21**			
Subject Title:	**Basics of Anatomy-II**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	To teach the fundamental concepts of Human Anatomy			

Unit	Contents	Contact Hours
I	Urinary System: Parts of Urinary system, location and gross structure of kidney, ureter, urinary bladder, urethra.	
II	Reproductive system: Parts of male reproductive system, gross structure of testis, vas deferens, epididymis, prostate, Parts of female reproductive system, gross structure of uterus, ovary, fallopian tube, mammary gland.	
III	Endocrine glands: Name of all endocrine glands, gross structure & functions of pituitary gland, adrenal gland, thyroid gland and parathyroid gland,	
IV	Nervous system: Neuron, classification of NS, Meninges, ventricles, CSF, Gross features of cerebrum, midbrain, pons, medulla oblongata, cerebellum, name of basal nuclei, Blood supply of brain, cranial nerves, Spinal cord and spinal nerves, Autonomic nervous system, Visual & auditory pathways Sensory Organs: Skin & its appendages, Structure of eye & lacrimal apparatus, name of extraocular muscles, Structure of ear: external, middle & inner ear.	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-202-21**			
Subject Title:	**Basics of Physiology-II**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	To teach the fundamental concepts of Human Physiology			

Details of the Course (Human Physiology)

Unit	**Contents**	**Contact Hours**
I	Endocrine System: Classification of Endocrine glands and their hormones. Thyroid Gland-Physiological Anatomy, hormones secreted, functions, disorders, Hypo and hyper secretion of hormone. Adrenal Gland-Adrenal Cortex-Physiological Anatomy, its hormones and functions, Adrenal Medulla-Hormones, functions. Pituitary Gland- Anterior and posterior pituitary hormones and their functions/ disorders. Pancreas- Hormones and their functions, Diabetes Mellitus-types, pathophysiology, signs and symptoms. Parathyroid Gland- Hormones and their functions.	
II	Central Nervous System: Structure of neuron, functions of nervous system, Classification and properties of nerve fibres, Synapse- structure and types, Receptors-Definition, classification, properties, Reflex Arc, Ascending and Descending tracts- names and functions, Functions of Hypothalamus, Functions of Cerebellum and Basal Ganglia, Functions of Cerebral Cortex, Autonomic Nervous System- Actions of sympathetic and parasympathetic system and their comparison,	
III	Special Senses-Eye-structure, functions of different parts, Visual acuity, Refrectiveerrors.Ear-structure, functions, General mechanism of hearing Excretory System: Kidneys-structure of nephron, functions of kidney, Glomerular filtration Rate(GFR) and factors affecting it, Counter Current Mechanism, Bladder-its innervation, micturition reflex	
IV	Reproductive System: Male Reproductive System-Stages of spermatogenesis, function of Testosterone, Female Reproductive System-Ovulation, menstrual cycle, functions of Estrogen and progesterone Nerve Muscle Physiology: Classification of Muscle, structure of skeletal muscle, Neuromuscular Junction, Excitation Contraction Coupling	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

Course Name	B.Sc. in Radiology Imaging & Technology			
Subject Code:	**BRIT-203-21**			
Subject Title:	**Radiography Photography-II**			
Contact Hours:	**L:3**	**T:1**	**P:0**	**Credits:4**
Examination Duration (hours)	**3**			
Objective(s):	**To teach the fundamental concepts of Radiography.**			

Details of the Course (Radiography Photography)

Unit	Contents	Contact Hours
I	Preparation of solutions and making stock solution. Processing equipment: materials for processing equipment, processors for manual operation, hangers, control of chemicals temperature by heating and thermostate, immersion heaters as well as cooling faults. Dark Room: Layout and planning. Dark room construction-Nature of floor, walls, ceiling and radiation protection. Type of entry, door design. Dark room illuminations-white light and safe lighting.	
II	Dark room equipment and its layout. Location of pass through boxes or cassette hatches. Systems for daylight film handling. Daylight systems using cassettes and without cassettes. The Radiographic image: components in image quality-density, contrast and detail. Un-sharpness in the Radiographic image. Various factors contributing towards un-sharpness – geometric, photographic; motional, mottle, graininess, distortion.	
III	The presentation of the Radiograph. Identification markers and orientation. Documentary preparation. Viewing accessories: Viewing boxes, magnifiers, viewing conditions. Light images and their recording. The laser imager, CRT cameras, Video-imagers, dry silver imaging. Photo flurography: cine cameras. Cine fluorography, cine film, derail cameras, processing of cine films, flurographic films.	
IV	Cameras for photo flurography. Sensitometric response of fluorography film. Some special imaging processes, Xero-Radiography its meaning, technique and applications.	

	Substraction: its techniques applied to Radiography as well as its applications. Common film faults due to manufacturing as well as due to chemical processing. Management of the quality of the Radiography images and image quality control.	

Reference Books

S.No.	Author(s)	Title of the Book	Publisher/Year
1	DR.S.K.BHARGAVA	RADIOLOGY FOR RESIDENTS AND TECNICIANS	CBS
2	K THAYALAN	THE PHYSICS OF RADIOLOGY AND IMAGING	
3	Fred. A. Mettler Jr.	Essentials of Radiology	Elsevier
4	DR.BUSHAN N LAKHAR	RADIOLOGICAL PROCEDURES	ARYAN

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-204-21**			
Subject Title:	**Basics of Anatomy-II Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Human Anatomy			

Sr. No.	**Contents**	**Contact Hours**
I	**Demonstration of parts of excretory system** • **Demonstration of various parts of nervous system (brain and spinal cord)(Model)** • **Structure of eye and ear (demonstration from models)** • **Demonstration of reflex action** • **Demonstration of various parts of reproductive system (Male and female from models and charts)** • **Study of Urinary system (charts)** • **Study of Genital system (male & female) from charts and TS of testis and ovary from permanent slides.** • **To study nervous system (From models / charts)**	

Reference Books

S.No.	**Author(s)**	**Title of the Book**	**Publisher/Year**
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-205-21**			
Subject Title:	**Basics of Physiology-II Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Human Physiology			

Sr. No.	**Contents**	**Contact Hours**
I	Estimation of Hemoglobin Concentration - Determination of Bleeding Time and Clotting Time - Determination of Blood Groups - Recording of normal Blood Pressure - Clinical Examination of Arterial Pulse - Determination of Vital Capacity	

Reference Books

S.No.	**Author(s)**	**Title of the Book**	**Publisher/Year**
1	Ross & Wilson Anatomy and Physiology	Anne Waugh, Allison Grant	Churchill Livingstone
2	Principles of Anatomy & Physiology	Tortora & Bryan	WILEY
3	Kathleen J.W. Wilson	Anatomy and Physiology in Health and Illness	Churchill Livingstone, New York
4	Arthur C,GuytonandJohn.E	Text book of Medical Physiology	Hall. Miamisburg, OH, U.S.A

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging & Technology**			
Subject Code:	**BRIT-206-21**			
Subject Title:	**Radiography Photography-II Practical**			
Contact Hours:	**L:0**	**T:0**	**P:4**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	To make the students learn practical aspects of Radiography & Imaging Technology			

Sr. No.	**Contents**	**Contact Hours**
I	**Practicals:** **To prepare a characteristic curve of a Radiography film** **To check the effect of safe light on exposed as well as unexposed x-ray film.**	

Reference Books

S.No.	**Author(s)**	**Title of the Book**	**Publisher/Year**
1	DR.S.K.BHARGAVA	RADIOLOGY FOR RESIDENTS AND TECNICIANS	CBS
2	K THAYALAN	THE PHYSICS OF RADIOLOGY AND IMAGING	
3	Fred. A. Mettler Jr.	Essentials of Radiology	Elsevier
4	DR.BUSHAN N LAKHAR	RADIOLOGYLOGICAL PROCEDURES	ARYAN

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging &Technology**			
Subject Code:	**EVS102-18**			
Subject Title:	**Environmental Studies**			
Contact Hours:	**L:2**	**T:0**	**P:0**	**Credits:2**
Examination Duration (hours)	**3**			
Objective(s):	**To learn the basics of Environmental issues.**			

Unit	Contents	Contact Hours
I	Introduction to Environmental Studies Multidisciplinary nature of Environmental Studies: Scope & Importance Need for Public Awareness Ecosystems Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers) Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids Characteristic features, structure & functions of following Ecosystems: • Forest Ecosystem • Aquatic Ecosystem (Ponds, Lakes, River & Ocean)	
II	Natural Resources Renewable & Non-renewable resources Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification. Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy	
III	Biodiversity & its conservation Types of Biodiversity: Species, Genetic & Ecosystem India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India Examples of Endangered & Endemic species of India, Red data book Environmental Pollution & Social Issues Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazards and accidents & Health risks Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides	
IV	Field Work Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest Visit to a local polluted site : Urban/Rural/Industrial/Agricultural Identification & Photography of resident or migratory birds, insects (butterflies) Public hearing on environmental issues in a village	

Reference Books

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
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7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29---64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
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11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
14. Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998*. Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987.*Our Common Future*. Oxford University Press.

I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY				
Course Name	**B.Sc. in Radiology Imaging &Technology**			
Subject Code:	**BMPD-202-18**			
Subject Title:	**Mentoring & Professional Development**			
Contact Hours:	**L:0**	**T:0**	**P:1**	**Credits:1**
Examination Duration (hours)	**3**			
Objective(s):	**To learn the lifelong learning skills.**			

Sr. No.	Contents	Contact Hours
I	**Part-A (Class Activities)** 1. Expert and video lectures 2. Aptitude Test 3. Group Discussion 4. Quiz (General/Technical) 5. Presentations by the students 6. Team building Exercises 7* A part of above six points practicals on Fundamentals of Computers are also added as per Annexure-I	
II	**Part-B (Outdoor Activities)** 1. Sports/NSS/NCC 2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.	

Evaluation shall be based on performance for Part – A & B

Mentors/Faculty in-charge shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.