# Hong Kong College of Radiologists
# Basic Training Course in Cancer Biology & Radiobiology
# Teaching Time Table (2024)

**DATE:** **17th August 2024 – 14th December 2024**

**TIME:** **Lecture:** **9:00 a.m. – 11:30 a.m. (Sat)**
**Workshop:** **11:45 a.m. – 1:00 p.m. (Sat)**

**VENUE:** **Lecture:** **15 lectures (9 for cancer biology; 6 for radiobiology)**
**Conference Room (Room 1203), 12/F, Block R,**
**Department of Clinical Oncology, QEH**

**1 lecture for radiobiology**
**† Lecture Theatre, 12/F, Block R,**
**Department of Clinical Oncology, QEH**

**Workshop:** **3 workshops (A-C; 2 for cancer biology; 1 for radiobiology)**
**13/F, Block R, HK Jockey Club Cancer Research Laboratory,**
**Department of Clinical Oncology, QEH**

**COURSE COORDINATOR:** **Dr. Timothy TC YIP**

**TUTORS:** **Dr. Timothy TC YIP (TY; Senior Medical Science Advisor, Lucence Diagnostics Ltd.)**
**Dr. William C CHO (WC; SO i/c, Radiobiology & Cancer Research Unit)**

## Cancer Biology

| No. | Date | Session | Time | Topic |
|---|---|---|---|---|
| 1 | 17/8/24 | Lecture (TY) | 9:00-11:30 | **Techniques in molecular biology:**<br>• Nucleic acid analyses including electrophoresis,<br>• hybridisation, blotting, PCR, sequencing, transfection<br>• Microarray techniques<br>• Transgenic models |
| A | 17/8/24 | Workshop (WC) | 11:45-13:00 | **Molecular biological techniques for cancer studies** |
| 2 | 24/8/24 | Lecture (WC) | 9:00-11:30 | **General principles of tumor biology & aberrant cell growth control:**<br>• Definitions of growth disorders, dysplasia and carcinoma *in situ*<br>• Mechanisms of local invasion & metastasis<br>• Basic on cell cycle |

| No. | Date | Session | Time | Topic |
|---|---|---|---|---|
| | | | | • Control of cell growth<br>• Autocrine, paracrine & endocrine growth factors<br>• Altered expression in malignancy |
| 3 | 31/8/24 | Lecture (WC) | 9:00-11:30 | **Causation of human cancers:**<br>• Environmental factors<br>• Carcinogenesis<br>• Viral carcinogenesis (HPV, EBV, etc)<br>• Radiation carcinogenesis<br>1. Ionising & non-ionising radiation<br>2. DNA damage & repair, nucleotide excision repair<br>3. Repair genes & gene products |
| 4 | 7/9/24 | Lecture (WC) | 9:00-11:30 | **The genetics of normal and malignant cells:**<br>• Point mutations, translocations, deletions, gene amplification and over-expression<br>• Oncogenes, proto-oncogenes, tumor suppressor genes (with examples)<br>• Polymorphism, mini & microsatellites<br>• Brief chromatin & chromosomal structure<br>• Gene therapy |
| 5 | 14/9/24 | Lecture (TY) | 9:00-11:30 | **The epigenetics of normal and malignant cells:**<br>• DNA hypermethylation, hypomethylation & association with cancer<br>• Methylation reversal<br>• Histone acetylation & deacetylation & association with cancer<br>• Protein-protein interactions |
| 6 | 21/9/24 | Lecture (WC) | 9:00-11:30 | **The physiology of haemopoiesis:**<br>• Marrow structure and organisation<br>• The haemopoietic microenvironment<br>• Cell lineages and hierarchies<br>• Control mechanisms in normal haemopoiesis<br>• Tumour vasculature and angiogenesis |
| 7 | 28/9/24 | Lecture (TY) | 9:00-11:30 | **Growth of normal and malignant cells:**<br>• Tumor kinetics<br>• Signal transduction (MAP kinase pathway, etc), kinase inhibitors & cancer<br>• Cyclin, cyclin kinases & inhibitors & cancer<br>• Gene promotors |

| No. | Date | Session | Time | Topic |
|---|---|---|---|---|
| 8 | 12/10/24 | Lecture (WC) | 9:00-11:30 | **The immune system:**<br>• Cellular immune system<br>• Antigen recognition & processing<br>• Dendritic cells<br>• Immunological surveillance<br>• Tumor immunology<br>• Immunotherapy |
| B | 12/10/24 | Workshop (WC) | 11:45-13:00 | **Immunological techniques for cancer studies** |
| 9 | 19/10/24 | Lecture (TY) | 9:00-11:30 | **Cancer susceptibility & inheritance genetics:**<br>• Inherited syndromes: AT, XP, Nijmegin break syndrome<br>• Li-Fr, Lynch, MEN, Cockayne, FPC, inherited breast cancer syndromes<br>• Genes conferring susceptibility to cancer<br>• Familial linkage analysis<br>• Genetic counseling |

## Radiobiology

| No. | Date | Session | Time | Topic |
|---|---|---|---|---|
| 1 | 26/10/24 | Lecture (WC) | 9:00-11:30 | **General principles of radiobiology:**<br>• Cellular systems (hierarchical, flexible) and their response to radiation<br>• Parallel and linear systems<br>• LET and its relevance to cellular damage<br>• Radiation damage at the cellular level (membrane, cytoplasm, nucleus) |
| 2 | 2/11/24 | Lecture (TY) | 9:00-11:30 | **Cell survival curves, radiation damage & repair:**<br>• Current formulae applied to cell survival curves determination (e.g. Linear quadratic model, α & β cell kill, α/β)<br>• Cell cycle sensitivity to radiation, repair of sublethal & potentially lethal damages by radiation (i.e. SLDR & PLDR) |

| No. | Date | Session | Time | Topic |
|---|---|---|---|---|
| 3 | 9/11/24 | Lecture (TY) | 9:00-11:30 | **Assays for cell survival & radiation damage:**<br>• Radiation biology models (monolayer, spheroids, animal)<br>• (normal and transgenic), regrowth curves, clonogenic assay, MTT<br>• In vitro, in vivo & in situ methods for cell survival & damage determination<br>• Biological dosimetry techniques (dicentric chromosomes & micronuclei etc.) |
| C | 9/11/24 | Workshop (WC) | 11:45-13:00 | **Cell culture, mouse models & biological dosimetry techniques for radiobiology studies.** |
| 4 | 16/11/24 | Lecture (TY) | 9:00-11:30 | **Oxygen effects, hypoxia & biological modifiers:**<br>• Oxygen effects, hypoxia & its model<br>• Radiosensitizers, halogenated pyrimidines; radioprotectors |
| 5 | 30/11/24 | Lecture (TY) | 9:00-11:30 | **Physical factors affecting cell survival, fractionation & 4R:**<br>• Relative biological effectiveness (RBE)<br>• RBE & LET, dose, dose rate and fractionation<br>• Hyperfractionation and accelerated treatment<br>• Repair, reoxygenation, redistribution, repopulation |
| 6 | 7/12/24† | Lecture (TY) | 9:00-11:30 | **Factors affecting therapeutic ratio & hyperthermia:**<br>• Influence on therapeutic ratio by dose, dose-rate & RT fraction numbers<br>• Isoeffect curves, NSD system, quality of irradiation<br>• Biologically effective dose (BED)<br>• Hyperthermia |
| 7 | 14/12/24 | Lecture (WC) | 9:00-11:30 | **Tumor and normal tissue radiobiology:**<br>• Normal tissue damage (early & late)<br>• Concept of normal tissue tolerance<br>• Factors influencing tolerance<br>• Effects of radiation on different tissues & organs<br>• Organ tolerance to retreatment with radiation<br>• Scheme for reporting normal tissue damage<br>• Effects on embryo & foetus<br>• Parenchymal & stromal injury |