FACULTY OF HEALTH SCIENCES AND SPORTS

BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY

(MEDICAL LABORATORY TECHNOLOGY)

LEARNING MODULE OUTLINE

Academic Year	2023/2024	Semester	2
Module Code	BSRM3102		
Learning Module	Research Methods		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese & English		
Credits	4	Contact Hours	60
Instructor	Grace, Meng Li Rong Pedro Fong	Email	lrmeng@mpu.edu.mo pedrofong@mpu.edu.mo
Office	M726, Meng Tak Building M729, Meng Tak Building	Office Phone	85993449 85993427

MODULE DESCRIPTION

This 60-hour course aims to improve the understanding of students in healthcare research with emphasis on the concept of scientific investigation; experimental design; research project planning; data measurement and collection; qualitative and quantitative data analysis; research proposal and poster creation; the basic concepts of ethical issues in scientific and medical research; research utilization and evidence based practice. This course also prepares students for writing thesis, medical articles and research papers.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Understand the purpose and concepts of medical research.
M2.	Propose and implement research project.
M3.	Analysis and Interpret research results.
M4.	Evaluate research articles.
M5.	Understand of basic concepts in research utilization and evidence based practice.
M6.	Write research reports and thesis.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3	M4	M5	M6
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to medical laboratory technology	✓	✓	✓	✓	✓	✓
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin medical laboratory operations and management	✓	✓	✓	✓	✓	✓
P3. To demonstrate understanding of major trends and issues related to medical laboratory technology	✓	✓	✓	✓	✓	✓
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in medical laboratory practice	✓	✓	✓	✓	✓	✓
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice	✓	✓	✓	✓	✓	✓
P6. To acquire and apply research skills in medical laboratory technology	✓	✓	✓	✓	✓	✓
P7. To demonstrate effective communication and teamwork skills	✓	✓	✓	✓	✓	✓
P8. To maintain professional and ethical standards in medical laboratory practice and research	✓	✓	✓	✓	✓	✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1. Subject introduction (2 hours--Grace) 1.1 Academic research 1.2 Key terms in research 1.3 Dimensions of research 1.4 General research process 1.5 Key challenges of conducting research 2. Basic concepts in research (2 hours--Grace) 2.1 Topic 2.2 Research problems 2.3 Research questions 2.4 Hypotheses 2.5 Statement of purpose 2.6 Aims and objectives 3. Research ideas (2 hours) 3.1 Source of research ideas 3.2 Global health agendas	6

Week	Content Coverage	Contact Hours
2	4. Development of research problems (2 hours--Grace) 4.1 Significance of the problems 4.2 Researchability of the problem 4.3 Time and timing 4.4 Availability of study participants 4.5 Co-operation 4.6 Facilities and equipment 4.7 Cost 4.8 Experience of the researcher 4.9 Case studies and group exercises 5. Selection of study participants (2 hours--Grace) 5.1 Populations and samples 5.2 Clinical and community populations 5.3 Convenience and probability samples 5.4 Selection criteria 5.5 Subject information sheet / consent form 6. Data collection approaches (2 hours--Grace) 6.1 Self reports 6.2 Observation 6.3 Biophysologic measures 6.4 Data collection plan	6
3	7. Questionnaires (4 hours--Grace) 7.1 Designing questionnaires 7.2 Styles and wording in questionnaires 7.3 Method of distribution / recruitment 7.4 Examples and exercises 8. Research bias and controls (2 hours--Grace) 8.1 Haphazard bias 8.2 Systematic bias 8.3 Group exercises 9. Qualitative data analysis (2 hours--Grace) 9.1 Transcribing 9.2 Categorization 9.3 Coding 9.4 Field notes	8
4	10. Quantitative Research (4 hours--Grace) 10.1 Introduction to Quantitative Research 10.2 Model for Conceptualizing Quantitative Research 10.3 Creating the Foundation for Quantitative Research 10.4 Research Hypotheses for Quantitative Research 10.5 Research Questions in Quantitative Research 10.6 Types of Variables 10.7 Making the Case for Quantitative Research	4

Week	Content Coverage	Contact Hours
5	11. Ethical Issue (2 hours--Grace) 11.1 Respect for persons 11.2 Beneficence 11.3 Review board approval 11.4 Special regulations for vulnerable 12. Scientific journal (4 hours--Grace) 12.1 Content of journal articles 12.2 Professional magazines and peer review journal 12.3 Science citation index 12.4 Letters 12.5 Research notes 12.6 Research articles 12.7 Supplemental articles 12.8 Review articles 12.9 Impact factor 12.10 Examples	6
6	13. Literature review (6 hours--Grace) 13.1 Purposes of literature review 13.2 Content of literature review 13.3 Skills and styles in writing literature review 13.4 Organization framework for literature review 13.5 Examples and group exercises 14. Research Poster (2 hours--Grace) 14.1 Purposes of scientific posters 14.2 Content of scientific posters 14.3 Skills in making effective scientific posters	8
7	15. Copyright and plagiarism (2 hours--Grace) 15.1 Authorship 15.2 Rights to authors 15.3 Reprints and postprints 15.4 Responsibilities of investigators 15.5 Scientific misconduct 15.6 Conflicts of interest 15.7 Types of plagiarism 15.8 Examples	2
8	16. Research proposal (8 hours--Grace) 16.1 Aims of proposal 16.2 Funding application 16.3 Content and format of proposal 16.4 Tips on successful proposal	8

Week	Content Coverage	Contact Hours
9	17. Introduction to data science research I (3 hours--Pedro) 17.1 Relational databases for healthcare professional 17.2 ER model and relational model 17.3 Structured Query Language (SQL) exercises 17.4 Research article sharing: *A large-scale dataset of in vivo pharmacology assay results* 18. Introduction to data science research II (3 hours--Pedro) 18.1 Medical ontologies and semantic web data 18.2 Resource Description Framework (RDF) 18.3 SPARQL tutorial 18.4 Research article sharing: *Biomedical Informatics on the Cloud* 19. Introduction to data science research III (2 hours--Pedro) 19.1 Statistical analysis of biomedical data using R 19.2 R-studio tutorial: summary statistics and hypothesis testing 8.21 Synaptic transmission 8.22 Reflexes 8.23 Sensory functions of the nervous system 8.24 Control of posture and movement 8.25 Central regulation of visceral function 8.26 Neural basis of instinctual behaviour and emotions 8.27 Electrical activity of the brain, sleep and wakefulness 8.28 Higher functions of the nervous system	8
10	20. Oral defense (4 hours--Grace)	4

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5	M6
T1. Lectures and videos	✓	✓	✓	✓	✓	✓
T2. Group discussion	✓	✓	✓	✓	✓	✓
T3. Oral defense	✓	✓	✓	✓	✓	✓

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Group reports	40%	M1-M6
A2. Proposal and oral defense	60%	M1-M6

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.

Any students scoring less than 35% of the total mark in the final examination will be given an "F" grade for the module even if the overall grade is 50% or higher.

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

澳門理工大學健康科學及體育學院

生物醫學技術理學士課程 (2023/2024)

論文建議書答辯評分表

組別 ：

學生姓名： _____ **學生編號：**

論文題目： _____

(每項由 0-100 分)

範圍	準則	評語	評分(0-100)
研究問題描述及理論架構 *(20%)*	● 目標具體合理 ● 具研究意義 ● 理論架構明確		

研究方法及計劃 *(40%)*	● 取樣合理可行 ● 研究設計及技術考慮周詳 ● 研究計劃合理完善 ● 危險性評估周詳，研究安全可行 ● 預算及採購計劃合理可行		
表述 *(20%)*	● 文字表達清楚明確、層次分明 ● 握要及完整 ● 條理分明 ● 有效運用各種圖表 ● 按照論文格式編寫		
個人表現 *(20%)*	● 是否經常無故：缺席、遲到、早退 ● 主動參與各項工作 ● 與其他組員採取合作態度 ● 提出良好構思 ● 操作各項實驗技術優良		
		總得分：	

指導老師簽署：_____ (　年　月　日)

Marks Ranges	**Grade**	**Grade Point**	**Grade Definitions****
93–100 88 – 92	A A-	4.0 3.7	Excellent
83 – 87	B+	3.3	Very Good
78–82 73 – 77	B B-	3.0 2.7	Good
68–72 63–67 58 – 62	C+ C C-	2.3 2.0 1.7	Satisfactory
53 – 57 50 – 52	D+ D	1.3 1.0	Passed
0 – 49	F	0	Failed

REQUIRED READINGS

Stepjhen Polgar, & Shane A. Thomas. (2008) Introduction to Research in the Health Sciences, Churchill Livingstone.

陳世耀，劉曉清 醫學科研方法. (2020) 人民衛生出版社.

REFERENCES

Carolyn Hicks. (2009) Research Methods for Clinical Therapists. Churchill Livingstone.

Felicity Smith & Sally-Anne Francis. (2008) International Research in Healthcare. Pharmaceutical Press.

Hulley, Stephen B.; Cummings, Steven R.; Browner, Warren S.; Grady, Deborah G. & Newman, Thomas B. (2007) Designing Clinical Research. Lippincott Williams & Wilkins.

Tom Heath and Christian Bizer. (2011) Linked Data: Evolving the Web into a Global Data Space. Morgan & Claypool Publishers.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.