

National University-Sudan

Faculty of Graduate Studies and Scientific Research



Graduate Prospectus

2018

<https://www.nu.edu.sd>

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Vision and Mission of the Graduate Studies - NUSU

Vision

NUSU be the leading provider of graduate programs assuring most distinctive ever excelling excellence



Mission

Grantee and maintain high quality standards of graduate programs offered by NUSU through continuous internal and external assessment to secure sustainability and social responsibility

Welcome Note from the President of NUSU



On behalf of the staff of National University-Sudan, I congratulate you for joining the Faculty of Graduate Studies and Scientific Research.

This Faculty was established after extensive studies to identify the necessary infrastructure and qualified staff to run a unique institute satisfying the high demands in these fields.

Again you are welcome and I wish you successful academic career.

Dr. Amin Osman Sid Ahmed
President, National University - Sudan

Message from the Dean Faculty of Graduate Studies and Scientific Research



- With great pleasure the Faculty of Graduate Studies and Scientific Research of NUSU welcomes and invites students and stakeholders to profit from its distinguished high quality programs.
 - The programs offered by NUSU are well designed by experts to achieve well focused outcomes.
 - The programs are accredited by the Ministry of Higher Education and Scientific Research and continuously updated to comply with innovations in knowledge and technology.
 - The National University-Sudan obtained the ISO (International Standardization Organization) in 2009 and accredited by the BAC (British Accreditation Council) in 2015.
 - The Faculty of Graduate Studies and Scientific Research strictly abides by respect, ethics and social responsibility to conserve legal rights and privacies of the students and stakeholders.
 - NUSU provides and secures highly qualified staff and elegant environment (lecture rooms, to date laboratory facilities and equipment, paper and electronic libraries, rest rooms etc...) for convenient conveyance of the programs.
 - The teaching staff and the administrators are always ready for any help when needed.
- You are most welcome joining the Faculty of Graduate Studies and Scientific Research

You work hard to perfection
You do more to excel
You do more and more to excel yourself
Thence
NUSU congratulates you

About the Faculty of Graduate Studies and Scientific Research-NUSU

The National University-Sudan launched its graduate studies for the first time in July 2013 by admission of 12 students in Human Anatomy. The first batch of 11 students was graduated and awarded M.Sc. Human Anatomy in May 2015. The Faculty of Graduate Studies and Scientific Research was established in 2015 in compliance with the law of the National University-Sudan 2015. The Faculty of Graduate Studies and Scientific Research closely oversees the execution of the programs from admission to graduation and coordinates with the various faculties offering graduate programs to grantee distinctive high quality outcomes.

Programs and Degrees Offered by NUSU

Master by Course in:

- Business Administration General
- Projects Management
- Human Resource Management
- Financial Management
- Hospital Management
- Entrepreneurship
- Marketing.

Master by Course and Dissertation in:

- Hematology and Immuno Hematology
- Histopathology and Cytology
- Microbiology and Infection control
- Parasitology and Medical Entomology
- Chemical Pathology

Masters by Course and Dissertation in:

- Human Clinical Anatomy

PhD by Research in:

- Human Anatomy

Master by Course and Dissertation in:

- Hospital Pharmacy

Master by Course and Dissertation in:

- Medical Diagnostic Radiography
- Diagnostic Medical Ultrasound

Master by Course in:

M.Sc. Bioinformatics (Awaiting final approval from MHESR)

Outlines of the Programs Offered by the Faculties of NUSU





(A)

Faculty of Administrative Sciences



Master of Business Administration (MBA)

General Introduction

Success in business, not like ever before, requires an innovative thinking and apt skills to comply with the imperatives and conditions of the era of knowledge, globalization and international trade. This implies an involvement of highly qualified personnel in business vis-à-vis:

- Business Administration General
- Projects Management
- Human Resource Management
- Financial Management
- Hospital Management
- Entrepreneurship
- Marketing

For this the National University offers a program in business administration (MBA) coping with community needs as due to graduate self-employment in light of the limited and rare government job opportunities. The MBA program also targets bridging the gap in university teachers, and researchers in business administration.

General objectives

- Provide training opportunities at master level in management for university staff and for seekers of professionalism.
- Familiarize the potential candidacy of the program with concepts and principles of management
- Empower the business sector in Sudan with qualified personnel in management
- Prepare the Sudanese industry for competitive globalization and international trade.

Human Resources and Facilities

Teaching staff: One professor
Five associate professors
Five assistant professors

Facilities: Four lecture rooms: 200 seats
Two computer labs: 150 seats
National University main library: 400 seats
E-library: 250 seats

Admission requirements

- Applicant must satisfy the general regulations set by the faculty of graduate studies and scientific research of the National University for registration for master degrees.
- Eligible candidates are:
 - (a) Holders of B.Sc. with grade good minimum.
 - (b) Holders of B.Sc. with grade pass plus a Postgraduate Diploma.
 - (c) Holders of B.Sc. with grade pass plus three years of experience at least.

Duration of program: Three semesters: 15 weeks each

Teaching modules

Lectures; Seminars and Presentations; Case studies; Group research; Assignments; Report writing, Guest speaks.

Teaching language: English

Examinations regulations

- Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- A student scoring less than 60% in any subject should sit for a supplementary examination.
- A student failing any supplementary examination should repeat the course.
- Each student shall conduct a supervised published or accepted paper in a refereed journal.

Assessment:	Continuous assessment	50%
	Final examination	50%

Grading system: A⁺ (≥ 85) A (80 – 84) B⁺ (70 – 79) B (65 – 69) C (60-64) F (< 60)

**Master of Business Administration
(MBA)
General**

Specific objectives

The program qualifies the candidates to:

- Communicate professionally to bridge diverse perspectives, cultures, and disciplines.
- Analyze ethical implications in business practices.
- Apply quantitative problem-solving methods in business.
- Assess global opportunities and challenges facing business growth.
- Behave and collaborate as a business leader.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Identify and solve organizational problems by systematic and analytical decision-making approaches.
- Identify personnel values and their effect on decision-making within an organization.
- Evaluate the compliance of plans and actions with the organization's values.
- Manage personnel to meet changing organizational needs in business environment.
- Evaluate the implications of changing environment on organization's choices.

Study program

Semester One

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + MAG-531 Strategic Management and MAG-538 Research Paper)

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
MAG-531	Strategic Management	3(2+1)	2	2
MAG-532	Managerial Economics	3(2+1)	2	2
MAG-533	Leadership and Decision Making	3(2+1)	2	2
MAG-534	Total Quality Management	3(2+1)	2	2
MAG-535	Marketing Research	3(2+1)	2	2
MAG-536	Corporate Finance	3(2+1)	2	2
MAG-537	International Business	3(2+1)	2	2
MAG-538	Research Paper	3(0+3)	0	6

Courses Contents

ACC-511 Cost and Management Accounting

Introduction; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution, promotion, Wholesaling and retailing. Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information systems successes and failures; Privacy and security of information systems; Ethical and social aspects related to information systems; Information systems departments (ISD).

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information system success and failure; Privacy and security of information systems; Ethical and social aspects related to information system; Information system departments (ISD).

FIN-514 Financial Management

Introduction and objectives; Financial management environment; Interest rates and required rate of returns; Financial statements; Taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value (NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling, Development programs: motivation and compensation; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP-523 Business Ethics and Social Responsibility

Introduction; Ethics in business; Good life as the goal of ethics; Finding Ethics in Business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity planning; Facilities layout; Inventory control; Materials required for planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management.

MEP-525 Entrepreneurship

Introduction; Entrepreneurial process; Entrepreneurship and creativity; Entrepreneurial assessment; Business plan development; Business plan writing; Presenting business plan; Business problem-solving for the Entrepreneur; Marketing plan development; Customer new business start up; Basic and advanced website development; Entrepreneurship in practice; Applications: eBay®; Developing business opportunities and plans; Taking innovation to Market; Financing entrepreneurial operations.

MAG-531 Strategic Management

Introduction; Internal context of strategy; Exploring the external environment: Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

MAG-532 Managerial Economics

Scope of managerial economics; Basic economic concepts; Elasticity and revenue; Demand estimation; Competitive market equilibrium; Production Iso-quants; Marginal rate of technical substitution; Iso-cost line; Cost analysis and estimation: Cost function; Profit maximization; Markets types.

MAG-533 Leadership and Decision Making

Define leadership; Personal leadership; Organizational leadership; Global leadership; Personal leadership profile; Leadership in Community context; Leadership theory; Leadership concepts.

MAG-534 Total Quality Management

Basics of total management; Evolution of quality; Foundations for total quality management; Total quality management (TQM) culture; Preparing for total quality management; Quality problems; Quality certification; TQM performance.

MAG-535 Marketing Research

Role of marketing research in management; Decision-making: definition and research process; Secondary data and databases; Qualitative research; Survey research; Primary data collection; Observation; Experimentation; Concept of measurement attitude and scales; Questionnaire design; Sampling issues; Data processing and data analyses; Communicating research results; Managing marketing research; Research ethics.

MAG-536 Corporate Finance

Objectives and organization; Financial institutions; Markets; Types of financing: Short and long term loans; Lease finance; Capital structure; Long term finance; Equity financing; Debt financing; Cost of capital; Valuation of stock and bonds; valuation of stock, Valuation of stock and bonds; Risk and return; Dividend policy.

MAG-537 International Business

Future and challenges of globalisation; Economic, legal, and political systems; Ethics and international business; International trade: Firms and international trade; Governments and regulations of international trade; Foreign direct investment (FDI); Sudan bilateral agreements; Technical and financial studies in domestic and MNC companies; Foreign market entry modes.

ENP-538 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

Master of Business Administration

(MBA)

General

**(2) Master of Business Administration
(MBA)
Human Resources Management**

Specific objectives

The program qualifies the candidates to:

- Understand the growing capabilities of Human Resources.
- Encourage employees to introduce innovations.
- Understand evolutions in management thoughts for business decision- making.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Explain the scope of HRM
- Understand and appreciate the meaning and nature of strategic HRM related to business
- Describe HR strategies informed by knowledge of labor markets and product markets locally, nationally and internationally
- Describe the dynamic nature of global competition, social, technological trends and their significance on HRM practices.

Study program

Semester One

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + HUR-531 Strategic Management and HUR-538 Research Paper)

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
HUR-531	Strategic Management	3(2+1)	2	2
HUR-532	Corporate Performance Management	3(2+1)	2	2
HUR-533	Personnel Management in International Organizations	3(2+1)	2	2
HUR-534	Labor Laws and Social Insurance	3(2+1)	2	2
HUR-535	Human Resources Strategic Management	3(2+1)	2	2
HUR-536	Negotiation Skills and Conflict Management	3(2+1)	2	2
HUR-537	Organization Development and Change	3(2+1)	2	2
HUR-538	Research Paper	3(0+3)	0	6

Courses contents

ACC-511 Cost and Management Accounting

Introduction; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution and promotion, Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information systems successes and failures; Privacy and security of information systems; Ethical and social aspects related to information systems; Information systems departments (ISD).

FIN-514 Financial Management

Introduction; Objectives of financial management; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP-523 Business Ethics and Social Responsibility

Introduction; Ethics in business; Good life as the goal of ethics; Finding ethics in business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operations Management

Introduction; Location planning; Capacity planning; Facilities layout; Inventory control; Materials required for planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management

MEP-525 Entrepreneurship

Introduction; Entrepreneurial Process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem-solving for the Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practice; Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

HUR-531 Strategic Management

Introduction; Internal context of strategy; Exploring the external environment: Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

HUR-532 Corporate Performance Management

Corporate performance management; Performance planning and analysis; Implementing performance management systems; Strategy driven performance management; Measuring results via scorecards; Performance management and people development; Performance management in action; Employee development; Team development and coaching; Development plans; Performance management and reward system; Performance management and knowledge development; Performance consulting.

HUR-533 Personnel Management in International Organizations

Overview of personal management; Best employees; Paying employees; Providing benefits, Training employees; Compliance with regulations; Ensuring safe work environment; Sustained high performance employees; General resources; Qualified new employees; Job description and orientation; Personnel records; Employees performance appraisal.

HUR-534 Labor Laws and Social Insurance

Concepts of labor law; Trade unionism; Collective bargaining; Workers participation in management; Labor welfare and social security; ILO-convention and labor administration;

Workers' compensation schemes and redundancy; Qualifying for social security benefits; Social security benefit amount; Taking benefits before retirement age; Windfall elimination provision and government pension offsets; Medicare and social security; Strategies for maximizing social security; Six pillars of retirement income.

HUR-535 Human Resources Strategic Management

Introduction; Strategy formulation; Role of value in strategy formulation; Strategy implementation, communicating strategy to staff; Competitive strategy; Competitive advantages; Competitive differentiator Ethics; Linking HR to organization strategy; Organizational effectiveness; Trends in HR; Mission and vision; Quality management.

HUR-536 Negotiation Skills and Conflict Management

Course overview; Kinds of negotiators; Distributive and mixed motive bargaining; Integrative and mixed-motive bargaining; Competitive and cooperative styles; Negotiating in context, origins of conflict-dispute prevention; Delegating conflict management to the disputants; Employers' dispute resolution; Complaint handling systems; Conciliation; Mediation; Arbitration; Negotiation with difficult people.

HUR-537 Organization Development and Change

Introduction; Understanding change; Organizations change; Diagnosing change; Organizational diagnosis team time; Resistance to change; Implementing change; Organizational diagnosis team time, Communicating change, Continues communicating change, Organizational diagnosis team time; Sustaining change and thanks giving; Organizational diagnosis project; Presentations.

HUR-538 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**Master of Business Administration
(MBA)
Human Resources Management**

**(3) Master of Business Administration
(MBA)
Marketing**

Specific objectives

The program qualifies the candidates to:

- Understand aspects of marketing relevant to services and goods providing organizations.
- Develop strategies and approaches for addressing challenges.
- Identify services decision problems, ascertain alternatives, define crucial issues, analyze, decisions making and plan the implementation of decisions
- Identify services problems and propose solutions: Analyze to define problems, ascertain alternatives, make decisions and implement.

Expected learning outcomes:

Upon completion of the program, successful candidates should be able to:

- Develop socially responsible marketing approaches.
- Evaluate consumer behavior.
- Evaluate the challenges and opportunities in global marketing.
- Conduct and apply marketing research to enhance decision making.
- Develop comprehensive strategic marketing planning.
- Create e-commerce marketing solutions.

Study Program

Semester One

Code	Course	Credit hours	Contact hours	
			Lecture	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + MAR-531 Strategic Management and MAR-539 Research Paper)

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
MAR-531	Strategic Management	3(2+1)	2	2
MAR-532	Marketing Researches	3(2+1)	2	2
MAR 533	Marketing Strategies	3(2+1)	2	2
MAR-534	International Marketing	3(2+1)	2	2
MAR-535	Consumer Behavior	3(2+1)	2	2
MAR-536	Product and Brand Management	3(2+1)	2	2
MAR-537	Services Marketing	3(2+1)	2	2
MAR-538	Current Issues in Marketing	3(2+1)	2	2
MAR-539	Research Paper	3(0+3)	0	6

Courses contents

ACC-511 Cost and Management Accounting

Introduction; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions.

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution and promotion, Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information system success and failure; Privacy and security of information systems; Ethical and social aspects related to information system; Information system departments (ISD).

FIN-514 Financial Management

Introduction; Objectives of financial management; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP-523 Business Ethics and Social Responsibility

Introduction; Introduction to business ethics; Ethics in business; Good life as the goal of ethics; Finding ethics in business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity planning; Facilities layout; Inventory control; Materials required for planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management.

MEP-525 Entrepreneurship

Introduction; Entrepreneurial process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem-solving Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practices Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

MAR-531 Strategic Management

Introducing; Leading strategically; Examining internal context of strategy; Exploring external environment: Macro and industry dynamics; Crafting business strategy; Crafting business strategy for dynamic contexts; Looking at international strategies; Alliances and cooperative strategies; Employing strategy implementation levers. Strategic management; Internal context of strategy; Exploring external Environment: Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

MAR-532 Marketing Researches

Introduction; Role of marketing research ; Definition of research process, Secondary data and databases; Qualitative research; Survey research; Primary data collection; Observations; Experimentations; Concept of measurement attitude and scales; Questionnaires designs; Sampling issues; Data processing and analysis; Communicating research results; Managing marketing research, Research ethics.

MAR-533 Marketing Strategies

Introduction; Review of marketing elements; Analysis of marketing opportunities ; Analysis of marketing planning; Issues of e-marketing and global marketing; Managing integrated marketing communications; Insuring marketing and strategic management; Work together.

MAR-534 International Marketing

Introduction; Scope and challenges of international marketing; International marketing strategy; International legal environment; Foundations of culture; Cultural dynamics in assessing global

markets: Culture, management style and business systems; Political environment; Critical concern; International legal environment: Case studies

MAR-535 Consumer Behavior

Introduction; Consumer behavior; Consumer behavior-meeting changes and challenges; Consumer research process; Market segmentation and strategic targets; Consumer motivation; Personality and consumer behavior; Consumer perception; Consumer decision making; Consumer learning; Consumer attitude formation and change; Communications and consumer behavior; Culture influences on consumers behavior; Subculture and consumers behavior; Cross-cultural consumers behavior; Consumer and e-marketing; Marketing ethics and social responsibility.

MAR-536 Product and Brand Management

Introduction; Concepts of brands; Ownership and use; Brands registration; Loss of brands rights; Infringement; Basics of brands; Selecting brands; Protecting brands; International brands; Owner of brands; brands vs. copyright; Types of brands.

MAR 537 Services Marketing

Introduction; Frameworks for Services; Product catalog service; Marketing mix III: Distribution; Marketing Mix IV: Designing customer service processes; Marketing Mix V: Designing service environment; Marketing Mix VI: Service product; Marketing Mix VII: Managing service personnel; Marketing implementation I: Service Quality; Marketing implementation II: Managing service quality; Marketing implementation III: Growth strategies for service organizations; Services marketing: Integrating customer focus across a firm.

MAR-538 Current Issues in Marketing

Introduction; Intelligent marketing; E-Marketing; Relationship marketing; Customer relationship management; Developing innovative brand communications ; Design of marketing; Marketing services; New trends in marketing; Global marketing: Insights for going international; Marketing for academic and professional careers; applications.

MAR-539 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**Master of Business Administration
(MBA)
Marketing**

**(4) Master of Business Administration
(MBA)
Project Management**

Specific objectives

The program qualifies the candidates to:

- Communicate professionally to bridge diverse perspectives, cultures, and disciplines in project management.
- Analyze ethical implications in project management.
- Apply quantitative problem-solving methods in project management.
- Assess global opportunities and challenges facing project management growth.
- Behave and collaborate as a project manager.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Understand the essential elements of a project management foundation.
- Describe the concepts of project life cycle phases and project management process groups.
- Understand and describe all project management processes and applications.

Study Program

Semester One

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP -525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + PRO-531 Strategic Management and PRO-537 Research Paper)

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
PRO-531	Strategic Management	3(2+1)	2	2
PRO-532	Project Management Information Systems	3(2+1)	2	2
PRO-533	Total Quality Management	3(2+1)	2	2
PRO-534	Project Planning and Scheduling	3(2+1)	2	2
PRO-535	Supply Chain Management	3(2+1)	2	2
PRO-536	Projects Feasibility Study	3(2+1)	2	2
PRO-537	Research Paper	3(0+3)	0	6

Courses Contents**ACC-511 Cost and Management Accounting**

Introduction; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution and promotion; Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information systems success and failures; Privacy and security of information systems; Ethical and social aspects related to information systems; Information systems departments (ISD).

FIN-514 Financial Management

Introduction; Financial management Objectives; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP- 523 Business Ethics and Social Responsibility

Introduction; Business ethics; Ethics in business; Good life as the goal of ethics; Finding ethics in business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity planning; Facilities layout; Inventory control; Materials required for planning; Project control with PERT/CPM; Behavioral issues in operations

management; International issues in operations management; Service operations management; Quality management

MEP-525 Entrepreneurship

Introduction; Entrepreneurial process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem-solving for Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practice; Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

PRO -531 Strategic Management

Introducing; Leading strategically; Examining internal context of strategy; Exploring external environment: Macro and industry dynamics; Crafting business strategy; Crafting business strategy for dynamic contexts; Looking at international strategies; Alliances and cooperative strategies; Employing strategy implementation levers; Employing strategy implementation levers; Strategic management; Internal context of strategy; Exploring external environment; Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

PRO-532 Project Management Information Systems

Introduction; Program and project portfolio management; Project integration management; Project scope management; Projects and team: people, organizations and roles; Managing agreements and documents; Standard and custom reports; Guiding collaboration with policies and workflow diagrams; Information for common understanding prerequisites for collaboration; Cheapest and most reliable way to document and communicate information; Armor for defense against political or legal attacks; A window into project; Improving performance with report cards; Challenges to implementation.

PRO-533 Total Quality Management

Basics of total management; Evolution of quality; Foundations for total quality management; Total quality management (TQM) culture; Preparing for total quality management; Quality problems; Quality certification; TQM performance.

PRO-534 Project Planning and Scheduling

Introduction; Bases for project schedule; Project objectives and scope; Project milestones and budget; Basic network diagramming; Cornerstones of project management; Phases of project management; Scheduling front end; Project resources availability; Critical path; Project schedule tools; Expanded network diagramming; Bar chart; Assignments.

PRO-535 Supply Chain Management

Introduction; Supply chain management within organizations; Nature of firms; Evolution of supply chain; Role of supply chain management within fortune 500 companies; Design and development of a supply chain network; Measuring and analyzing the value and efficiency of

domestic and global supply chains networks; Planning for supply and demand within a supply chain; Economic effect of supply chains within corporate America; Barriers of overall supply chains; Coordination within a supply chain: BMW case; Pricing and revenue management in a supply chain; Major barriers facing supply chains networks in North America.

PRO-536 Projects Feasibility Studies

Introduction; Definition of entrepreneurship; Feasibility analysis process, Opportunity recognition and entrepreneurial research; Creation of ideas-preliminary model; Identify your industry; Market types; Financial research; Competitive analysis; Venture structure and the future; Group presentations.

PRO -537 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**Master of Business Administration
(MBA)
Project Management**

**(5) Master of Business Administration
(MBA)
Hospital Management**

Specific objectives

The program qualifies the candidates to:

- Know roles and responsibilities of health institutions managers.
- Identify processes of management in health institutions
- Comprehend behavior of others and innovative management.
- Identify necessary changes and developments in health organizations.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Analyze ethical implications of business practices using advanced levels of ethical reasoning
- Perform strategic analysis effectively
- Apply quantitative methods to business problem solving
- Assess global opportunities and challenges for business growth
- Evaluate the legal, social, and economic environments of hospital management.
- Apply decision-support tools to hospital management decision making.

Study Program

Semester One

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + HOS-531 Strategic Management and HOS-538 Research Paper)

Code	Course	Credit Hours	Communication hours	
			Lectures	Seminars
HOS -531	Strategic Management	3(2+1)	2	1
HOS-532	Supply Chain Management	3(2+1)	2	1
HOS-533	Total Quality Management	3(2+1)	2	1
HOS-534	Health Care Management	3(2+1)	2	1
HOS-535	Health Crisis Management	3(2+1)	2	1
HOS-536	Health Insurance and Social Security	3(2+1)	2	1
HOS-537	Computer Applications in Hospital Management	3(2+1)	2	1
HOS-538	Research Paper	3(0+3)	0	6

Courses Contents

ACC-511 Cost and Management Accounting

Introduction to management accounting; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution, promotion, Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information system success and failure; Privacy and security of information systems; Ethical and social aspects related to information system; Information system departments (ISD).

FIN-514 Financial Management

Introduction; Objectives of financial management; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction to human recourse management; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP-523 Business Ethics and Social Responsibility

Introduction to business; Introduction to business ethics; Ethics in business; Good life as the goal of ethics; Finding ethics in business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity Planning; Facilities layout; Inventory control; Materials required for Planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management.

MEP-525 Entrepreneurship

Introduction; Entrepreneurial process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem-solving for the Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practice; Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

HOS -531 Strategic Management

Introducing; Leading strategically; Examining internal context of strategy; Exploring external environment: Macro and industry dynamics; Crafting business strategy; Crafting business strategy for dynamic contexts; Looking at international strategies; Alliances and cooperative strategies; Employing strategy implementation levers; Employing strategy implementation levers. Strategic management; Internal context of strategy; Exploring the external environment: Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

HOS -532 Supply Chain Management

Introduction; Within organizations supply chain management; Nature of firms; Evolution of supply chain; Role of supply chain management within fortune 500 companies; Design and development of a supply chain networks; Measuring and analyzing the value and efficiency of a domestic and global supply Chains networks; Planning for supply and demand within a supply chain; Economic effect of supply chains within corporate America case study; Barriers of overall supply chains; Coordination within a supply chain: BMW case; Pricing and revenue management in a supply chain; Major barriers facing supply chain networks in North America; Revision of managing variability within a supply chain network; Trends in markets; Information technology in supply chain management.

HOS-533 Total Quality Management

Introduction; Total management; Evolution of quality; Foundations for Total quality management; TQM culture; Preparing for total quality management; Quality Gurus; Quality problems; Quality certification; TQM performance measurement.

HOS-534 Health Care Management

Introduction; Risk in society; Concept of risk; Chance of loss; Types of insurers and marketing systems; Insurance company operations; Life insurance and risk. Definition of insurance; Basic characteristics of insurance; Requirements of an insurable risk; Adverse selection and insurance; Benefits and costs of insurance on society; Health insurance; Personal property insurance: homeowner and auto insurance; Insurance market in Hungary; Institutions and insurance business in Hungary; Definition of insurance activities; Insurance companies; Classification of insurance branches; Technical provisions; Social security in Hungary: health insurance; Social security in Hungary: pension system; Application on SPSS.

HOS -535 Health Crisis Management

Introduction; Definitions and concepts of emergency; Emergency management; Form a team; Issue a mission statement; Review internal policies and plans; Identify critical products; Services and operations; Conduct a vulnerability analysis; Estimate probability; Plan components; Identify challenges and prioritize activities; Integrate the Plan into company operations; Emergency management considerations; Emergency Operations Center (EOC); Communications.

HOS -536 Health Insurance and Social Security

Introduction; Risk in society; Meaning of risk; Chance of loss; Peril and hazard; Types of insurers and marketing systems; Insurance company operations; Life and insurance and risk; Definition of insurance; Basic characteristics of insurance; Requirements of an insurable risk; Adverse selection and insurance; Benefits and costs of insurance on society; Health insurance; Personal property insurance: homeowner and auto insurance; insurance market in Hungary; Institutions and insurance business in Hungary; Definition of insurance activities; Insurance companies; Classification of insurance branches; Technical provisions; Social security in Hungary: health insurance; Social security in Hungary; Applications on SPSS.

HOS-537 Computer Applications in Hospital Management

Introduction; National perspectives and emerging issues; E-prescribing; Disease/Demographic Surveillance Systems; Intro to Excel; Functions of health information systems; Strategic planning; National perspectives: Impacts on professional development and tracking quality of patient care; Case studies in patient-care/ clinical decision-support systems and genomics and others; Ethical and legal issues in health care; Electronic health care records; Research and report writing in health care issues.

HOS -538 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**Master of Business Administration
(MBA)
Hospital Management**

**(6) Master of Business Administration
(MBA)
Finance**

Specific objectives

The program qualifies the candidates to:

- Know the importance and competitiveness of domestic and international companies.
- Choose appropriate business strategies and policies.
- Examine context of globalization in finance.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Critically analyze real world financial situations.
- Evaluate, measure risks and formulate action plans to attain strategic financial objectives of the organization.
- Find realistic viable solutions to complex problems.
- Communicate clear and concise financial information for decision making.

Study program

Semester One

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + FIN-531 Strategic Management and FIN-538 Research Paper)

Code	Course	Credit hours	Contact hours	
			lectures	seminars
FIN-531	Strategic Management	3(2+1)	2	2
FIN-532	Corporate Finance	3(2+1)	2	2
FIN-533	Islamic Banking and Finance	3(2+1)	2	2
FIN-534	Financial Institutions and Markets	3(2+1)	2	2
FIN-535	International Financial Management	3(2+1)	2	2
FIN-536	Portfolio Management	3(2+1)	2	2
FIN-537	Insurance and Risk Management	3(2+1)	2	2
FIN-538	Research Paper	3(0+3)	0	6

Course contents

ACC-511 Cost and Management Accounting

Introduction to management accounting; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions

MAR-512 Marketing Management

Market determination; Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution, promotion, Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information system success and failure; Privacy and security of information systems; Ethical and social aspects related to information system; Information system departments (ISD).

FIN-514 Financial Management

Introduction; Objectives of financial management; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project Applications.

ETP- 523 Business Ethics and Social Responsibility

Introduction to business; Introduction to business ethics; Ethics in business; Good life as goal of ethics; Finding ethics in Business; Business values; Ethics and legal professionals; Trust and truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity Planning; Facilities layout; Inventory control; Materials required for Planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management.

MEP-525 Entrepreneurship

Introduction; Entrepreneurial Process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem- solving for the Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practice; Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

FIN-531 Strategic Management

Introducing Strategic Management; Leading strategically; Examining internal context of strategy; Exploring external environment: Macro and industry dynamics; Crafting business strategy; Crafting Business Strategy for dynamic contexts; Looking at international strategies; Alliances and cooperative strategies; Employing strategy implementation levers; Employing strategy implementation levers. Strategic Management; Internal Context of strategy; Exploring the external Environment: Macro and industry dynamics; Crafting and dynamic business strategy; International strategies; Alliances and cooperative strategies; Implementation of strategies.

FIN-532 Corporate Finance

Objectives and organization; Financial institutions; Markets; Types of financing: Short and long term loans; Lease finance; Capital structure; Long term finance; Equity financing; Debt financing; Cost of capital; Valuation of stock and bonds; valuation of stock, Valuation of stock and bonds; Risk and return; Dividend policy.

FIN-533 Islamic Banking and Finance

Introduction to Islamic economics; Concept of Islamic finance; Concept of Sharia and Fiqh; Contemporary Islamic economic thought; Basic principles of Islamic law and finance; Principle of ibaḥaaşliyya; Prohibition of Riba; Gharar and Maisir; Principle of "risk sharing; Evolution and market trends of Islamic banking and finance; Sharia Boards and Corporate Governance, Sharia standards of the Accounting and Auditing Organization for Islamic Financial Institutions

(AAOIFI); Islamic modern finance; Islamic capital markets; Takaful and Re-takaful; Corporate social responsibility; Micro financing; Current issues and challenges in Islamic finance; Outlook.

FIN-534 Financial Institutions and Markets

Introduction; Financial system; Financial institutions; Commercial banks; Specialized banks; Islamic banks; Central bank; Non-bank institutions; Money markets; Capital markets, Financial markets, Foreign exchange markets; International financial institutions; Khartoum stock exchange market.

FIN-535 International Financial Management

Introduction; Global financial Markets; Foreign exchange theory; how forward markets reflect expectations of future spot rate? Foreign exchange exposure; Introduce main operating exposures experienced by firms; Financing a global firm; Determinants of financial structure of the foreign subsidiaries; Foreign investments; Managing capital internationally; Measuring equity market performance across borders; International CAPM; Differences between tax systems around the globe.

FIN-536 Portfolio Management

Introduction; Overview of investments and portfolio analysis; Markets for securities and taxes; risk and return; Economic analysis; Industry analysis; Bond analysis; Derivatives; Technical analysis; Portfolio analysis; Portfolio selection; Managed portfolios.

FIN-537 Insurance and Risk Management

Introduction; Concept of risk management; Definitions of risk; General risk relationships; Risk management process; Risk planning; Risk identification; Risk qualification; Risk response planning; Risk monitoring; Risk control; Introduction to concept of insurance.

FIN -538 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

Master of Business Administration

(MBA)

Finance

**(7) Master of Business Administration
(MBA)
Entrepreneurship**

Specific objectives

The program qualifies the candidates to:

- Identify entrepreneurial opportunities: types of markets.
- Employ technologies to create new markets.
- Invent and develop ideas to invent new products and services.
- Suggest new ways of doing business comprising infrastructures and industries.

Expected learning outcomes

Upon completion of the program, successful candidates should be able to:

- Use analytical and problem-solving skills in decision making.
- Identify differences among global economies, institutions, cultures and their implications on global management.
- Recognize and analyze ethical and legal problems related to business.
- Assume a leadership role as appropriate.
- Produce coherent written statement and oral presentations of complex business issues.
- Acquire knowledge and skills necessary to achieve the set professional goals.

Study program

Semester One

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ACC-511	Cost and Management Accounting	3(2+1)	2	2
MAR-512	Marketing Management	3(2+1)	2	2
MIS-513	Management Information Systems	3(2+1)	2	2
FIN-514	Financial Management	3(2+1)	2	2
MOB-515	Organizational Behavior	3(2+1)	2	2

Semester Two

Code	Course	Credit Hours	Contact hours	
			Lectures	Seminars
MHR-521	Human Resources Management	3(2+1)	2	2
PRO-522	Project Management	3(2+1)	2	2
ETP-523	Business Ethics and Social Responsibility	3(2+1)	2	2
MAG-524	Production and Operation Management	3(2+1)	2	2
MEP-525	Entrepreneurship	3(2+1)	2	2

Semester Three

(Three Elective Courses + ENP-531 Strategic Management and ENP-537 Research Paper)

Code	Course	Credit hours	Contact hours	
			Lectures	Seminars
ENP-531	Strategic Management	3(2+1)	2	2
ENP-532	Innovation Management	3(2+1)	2	2
ENP-533	Entrepreneurial Finance	3(2+1)	2	2
ENP-534	Small and Medium Enterprises Management	3(2+1)	2	2
ENP-535	Strategic Alliances	3(2+1)	2	2
ENP-536	New Venture Planning	3(2+1)	2	2
ENP-537	Research Paper	3(0+3)	0	6

Courses contents

ACC-511 Cost and Management Accounting

Introduction to management accounting; Management accounting and financial accounting; Cost and volume-profit analysis; Break-even analysis for multiple products; Budgeting and budgetary control; Departmental budgets; Capital budgeting; Standard costing; Pricing of products and services; Management accounting and business decisions.

MAR-512 Marketing Management

Market determination Customer value and satisfaction; Product planning and development; Strategic marketing decisions; Marketing of services; Branding packaging and labeling; Product policy; Pricing; Channels of distribution, promotion, Wholesaling and retailing.

MIS-513 Management Information Systems

Concepts of information systems; Managers information needs; Types of information systems: Planning and development; Tools and methods of building information systems, Information system success and failure; Privacy and security of information systems; Ethical and social aspects related to information systems; Information systems departments (ISD).

FIN-514 Financial Management

Introduction; Objectives of financial management; Financial management environment; Interest rates and required rate of returns; Financial statements: taxes, depreciation and cash flow; Risk and rates of return; Future and present value; Ordinary annuity; Annuity due and perpetuity; Effective annual interest rate (EAR); Cost of capital; Payback period; Net present value(NPV); Internal rate of return (IRR); Modified internal rate of return (MIRR); Payback period; Net present value internal rate of return (IRR); Modified internal rate of return (MIRR); Cash flow estimation and risk analysis; Capital structure and leverage; Financial statement analysis; Distributions to shareholders: Dividends and share repurchases.

MOB-515 Organizational Behavior

Introduction; Individual behavior: Personality and values; Individual perception and learning; Motivation and rewards; Decision making; Decision making and ethics, Ethics and conflicts, Negotiations; Communication in teams and with organizations.

MHR-521 Human Recourses Management

Introduction to human recourse management; HRM planning; Job design cycle; Recruitment and selection; Performance management system; Employees counseling; Development programs; Motivation; Compensation; Turnover program; Global HRM; Presentations.

PRO-522 Project Management

Introduction; Information system project environment; ISPM features; ISPM conflicts; Project communication; Alternate organization structures; Requirement analysis; Software development standards; Project applications.

ETP-523 Business Ethics and Social Responsibility

Introduction to business; Introduction to business ethics; Ethics in business; Good life as the goal of ethics; Finding Ethics in Business; Business values; Ethics and legal professionals; Trust and Truth; Advertising and consumer manipulation; Competition and self-control.

MAG-524 Production and Operation Management

Introduction; Location planning; Capacity Planning; Facilities layout; Inventory control; Materials required for Planning; Project control with PERT/CPM; Behavioral issues in operations management; International issues in operations management; Service operations management; Quality management.

MEP-525 Entrepreneurship

Introduction; Entrepreneurial Process; Entrepreneurship and creativity; Entrepreneurial assessment; Starting own business; Business plan development; Business plan writing; Presenting business plan; Business problem- solving for the Entrepreneur; Marketing plan development; Customer service for new business start up; Basic website development; Advanced website development; Entrepreneurship in practice; Applications: Introduction to eBay®; Developing business opportunities and plans; Taking innovation to market; Financing entrepreneurial operations.

ENP-531 Strategic Management

Introducing Strategic Management; Leading strategically; Examining internal context of strategy; Exploring external environment: Macro and industry dynamics; Crafting business strategy; Crafting Business Strategy for dynamic contexts; Looking at international strategies; Alliances and cooperative strategies; Employing strategy implementation levers; Employing strategy implementation levers.

ENP-532 Innovation Management

Introduction; Context of innovation and role of the state; Managing intellectual property; Building innovative organization; Sources of innovation; Innovation networks; Decision making under uncertainty; Developing an innovation strategy; Managing organizational knowledge; Managing R&D projects; Managing a new product development team; Group project presentations; Exploiting new ventures; Capturing benefits of innovations.

ENP-533 Entrepreneurial Finance

Introduction; Concepts of valuation for entrepreneurial ventures and possible funding sources Types of investments and planning horizons; Opportunities from funder view point; Management of teams and funders; Model opportunities; Relevant capital structures; Value options; Examine VC funding work; Funding rounds and business of funding; Challenges of managing and funding growth; Term sheets and concept of Due Diligence; Liquidity events: Initial public offerings, sales and mergers; Examine latest stage financing: mezzanine financing and buy-outs; International growth; Corporate and strategic venture funds.

ENP-534 Small and Medium Enterprises Management

Introduction; Legal status of small and medium size enterprises; EU classification of SMEs; Creation of small and medium size enterprises; EU classification of SMEs Financial needs and resources of small and medium-sized enterprises, Personal particulars of the operation of small and medium size enterprises; Transfer obligations of SMEs; Supporting institutes for development of small and medium size enterprises in the Slovak Economic information system for the needs of small and medium-sized enterprises; Position of SMEs in the area of SR.

ENP-535 Strategic Alliances

Strategic management process and concepts; value of vision; mission and corporate objectives; Role of corporate governance and stakeholder management; Coherence in strategic direction; External analysis; Porter's Five Forces model; General environment; Competitive environment; National environments; Creating environmentally aware organization; Internal analysis; Value chain analysis; Resource-based view of a firm; Evaluation of firm performance; Balanced scorecard; Main definitions and classifications; Competitiveness at macroeconomics level; Directions of macro competitiveness research; Factors determining an economy competitiveness potential; Rankings of international competitiveness of countries; Global Competitiveness Report; Main competitive strategies; Competitiveness of enterprises (theoretical issues); Types and sources of competitive advantages of enterprises; Potential and general characteristics of strategic alliances: Case studies, Typology of alliances II: Common integration, pseudo-concentration, complementary; Global network corporation.

ENP-536 New Venture Planning

Introduction; Importance of project planning; Elements of project planning; Project scope plan; Delivery schedule planning; Team building and planning; developing business plan; Planning and grant writing; Doing the project; Outcomes evaluation and assessment; Methodology of planning and project management; Stakeholder requirements; Technological and epistemological assumptions and methodological aspects in designing a new applications and services; Life cycle services applications; Risk analysis in development of services and applications; Brainstorming; Gordon's method; Implementation new systems for services and applications; Use of soft ware tools; Comprehensive Planning.

ENP-537 Research Paper: Publish a paper in a refereed scientific journal.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**Master of Business Administration
(MBA)
Entrepreneurship**



(B)
Faculty of Medical Laboratory Sciences



M.Sc. Medical Laboratory Sciences

General introduction

Medical Laboratory Scientists play a pivoting role in health care. They provide invaluable information for diagnosis, treatment and prevention of diseases. Though so important, the Medical Laboratory sector in Sudan experiences an acute shortage in qualified staff complying with the continuous advances and innovations in medical technologies vis-a-vis instrumentations and procedures.

For this, the Faculty of Medical Laboratory Sciences of the National University provides master programs by course in:

Hematology and Immuno Hematology

Histopathology and Cytology

Microbiology and Infection control

Parasitology and Medical Entomology

Chemical Pathology

General objective

To qualify critical mass of Medical Laboratory staff to work in universities, research centers and in health care units.

Human resources and facilities

Teaching staff: Three assistant professors

Three lecturers

Two technologists

One lab assistant

Facilities: Three lecture rooms: 70 seats each

Hematology lab: 60 seats

University main library: 400 seats.

E. Library: 250 seats.

Duration of the program: Three semesters: 16 weeks each

Teaching modules

Lectures, small group discussions, seminars and journal club, practical, residential field training, tutorials and assignments

Teaching language: English.

Examinations regulations

- Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- A student failing any supplementary examination should repeat the course.
- A student scoring less than 60% in the theoretical and / or the practical components of a specialization subject, should sit for a supplementary examination.
- Each student shall conduct a supervised piece of research.
- Duration of the research shall be 16 weeks. If need be, an extension of 4 weeks is allowed if approved by the program coordinator.
- Exceeding the aforementioned period (four weeks) the student has to settle a one semester extra fees to allow her/him an extension of extra four weeks.
- Expiring the extension periods without completing the dissertation, the student shall be dismissed from the program.
- A student scoring less than 60% in the dissertation oral examination will be allowed only one chance for oral defence. In such case the student should settle one semester fees.
- All students shall sit for an oral examination at the end of semester three.

Assessment: Continuous assessment: 30%
Final examination: 70%

Grading system: A⁺ (≥ 85) A(80 – 84) B⁺ (70 – 79) B (65 – 69) C (60-64) F (<60)

**(1) M.Sc. Medical Laboratory Sciences
Hematology and Immunoematology**

Specific objectives

The program qualifies the candidates to:

- Conduct advanced haematological tests for diagnosis and follow up of blood disorders.
- Run advanced coagulation tests to diagnose bleeding and thrombotic disorders.
- Perform all the serological tests necessary to provide safe blood and blood products.
- Perform blood fractionation.

Learning outcomes

Upon graduation from the program, students will be able to:

- Train and transfer knowledge to staff working in the laboratory settings
- Upgrade and efficiently manage the laboratory.
- Provide accurate diagnosis of blood
- Assure quality and abide by regulations of laboratory services.
- Write research proposals, conduct and evaluate the research projects in the field of Hematology and Immun Hematology.

Admission requirements

- Applicants must satisfy the general regulations set by the Faculty of Graduate Studies and Scientific Research of the National University- Sudan for registration for master degrees.
- Eligible candidates are holders of:
 - (a) B.Sc. (Honors) in Medical Laboratory Sciences in: Hematology and Immuohematology from the National University or from an equivalent university or a college.
 - (b) B.Sc. Medical Laboratory Sciences in Hematology and Immuohematology plus qualifying or postgraduate diploma from the National University or from an equivalent university or a college.

Study program

Semester One

Code	Course	Credit hours	Contact hours /Week	
			Theory	Practical
HEM-611	Benign Disorders of White Blood Cells	3(2+1)	2	2
HEM-612	Malignant Disorders of White Blood Cells	3(2+1)	2	2
HEM-613	Red Blood Cells Disorders I	3(2+1)	2	2
HEM-614	Red Blood Cells Disorders II	3(2+1)	2	2
HEM-615	Hemostatic System	3(2+1)	2	2
HEM-616	Bleeding and Thrombotic Disorders	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours/ week	
			Theory	Practical
HEM-621	Quality Assurance in Hematology	3(2+1)	2	2
HEM-622	Automation in Hematology	3(2+1)	2	2
HEM-623	Blood Transfusion and Stem Cell Therapy	3(2+1)	2	2
HEM-624	Hematological Changes in Systemic Diseases	3(2+1)	2	2
HEM-625	Hematology in Selected Populations	3(2+1)	2	2
HEM-626	Molecular Hematology	3(2+1)	2	2

Semester Three

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
HEM-631	Dissertation	8(0+8)	0	16

Courses contents

HEM- 611 Benign Disorders of White Blood Cells

Benign white cell disorders and causes; Lab diagnosis and follow-up; Application of the most up-to-date techniques.

HEM- 612 Malignant Disorders of White Blood Cells

Malignant white cell disorders and causes; Lab diagnosis and follow-up; Prognosis with application of the molecular, cytogenetic, cytochemical and immunological techniques.

HEM- 613 Red Blood Cells Disorders I

Red blood cells physiology and pathology; Routine and advanced investigations in diagnosis and follow-up of patients with anemias and other RBCs disorders.

HEM- 614 Red Blood Cells Disorders II

Hereditary and acquired hemolytic anemias; Aplastic anemia and polycythemia: routine and advanced investigations.

HEM- 615 Hemostatic system

Hemostatic mechanism: physiological and anatomical components.

HEM- 616 Bleeding and Thrombotic Disorders

Bleeding and coagulation disorders; Diagnose and monitor cases.

HEM- 621 Quality Assurance in Hematology

General and specific aspects of quality assurance and quality control in hematology lab.

HEM- 622 Automation in Hematology

Principles of cells counters ; Use and maintenance of automatic machines in hematology lab ; Interpretation of results

HEM- 623 Blood Transfusion and Stem Cell Therapy

Molecular basis; Biochemical basis; Detection methods of blood group antigens and hemopoietic stem cell biology; Perform compatibility tests prior to blood transfusion, bone marrow and solid organ transplantation.

HEM- 624 Hematological Changes in Systemic Diseases

Hematological manifestations of the systemic diseases: parasitic, bacterial, viral or autoimmunes.

HEM- 625 Hematology in Selected Populations

Specific hematological aspects in pediatrics, geriatrics and pregnancy.

HEM- 626 Molecular Hematology

Genetic and molecular bases of hematology ; Perform molecular diagnosis of hematological disorders.

HEM-631 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Award of the degree

The Scientific Council of the National University, based on the of recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**M.Sc. Medical Laboratory Sciences
Haematology and Immunohaematology**

(2) M.Sc. Medical Laboratory Sciences Histopathology and Cytology

Specific objectives

The program qualifies the candidates to prepare tissues and cells for:

- Histopathological and cytological techniques using light microscope.
- Immunological assessment of tissues by immunofluorescence and other immunohistochemical techniques.
- Cytogenetic and molecular techniques.
- Advance techniques in tissue transplantation, cell culture, and in-vitro fertilization principle.

Learning outcomes

Upon successful completion of the program, the graduate shall be able to:

- Use basic and advanced histopathological techniques.
- Apply cytogenetic techniques for detection of abnormalities of tissues.
- Perform internal and external quality control in histopathology lab.
- Abide by standards of bio-safety.

Admission requirements

- Applicants must satisfy the general regulations set by the Faculty of Graduate Studies and Scientific Research of the National University-Sudan for registration for master degrees.
- Eligible candidates are holders of:
 - (a) B.Sc. (Honors) in Medical Laboratory Sciences in: Histopathology and Cytology from the National University or from an equivalent university or a college.
 - (b) B.Sc. Medical Laboratory Sciences in Histopathology and Cytology plus qualifying or postgraduate diploma from the National University or from an equivalent university or a college.

Study program

Semester One

Code	Course	Credit hours	Contact hours/Week	
			Theory	Practical
HIS-611	Histopathological Techniques	3(2+1)	2	2
HIS-612	Advanced Histopathological Techniques	3(2+1)	2	2
HIS-613	Immunohistochemisrty Techniques	3(2+1)	2	2
HIS-614	Immunofluorescent Techniques	3(2+1)	2	2
HIS-615	Cytology and Cytological Techniques in Non-Gynecology	3(2+1)	2	2
HIS-616	Cytology and Cytological Techniques in Gynecology	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
HIS-621	Histopathological Diagnosis	4(3+1)	3	2
HIS-622	Cytogenetic and Molecular Techniques	4(3+1)	3	2
HIS-623	Tissue Transplantation Technology	4(3+1)	3	2
HIS-624	Cell Culture Technology	2(1+1)	1	2
HIS-625	Stem Cell Culture Technology	2(1+1)	1	2
HIS-626	In-vitro Fertilization Technology	2(1+1)	1	2

Semester Three

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
HIS-631	Dissertation	8(0+8)	0	16

Courses contents

HIS-611 Histopathological Techniques

Tissue preparation for light microscopy; Histological preparations; Procedure of biopsy: grossing, fixation, processing, embedded, microtome sectioning; Preparation of routine stain hematoxylin and eosin for routine work; Microtome sectioning and trouble shooting.

HIS-612 Advanced Histopathological Techniques

Special staining techniques and dye to identify different tissue disease carbohydrate (mucin, glycogen), connective tissue (fiber and cell), pigments and lipids, nerve system, bone disease. tissue microarray techniques. Demonstration of microorganisms using to confirm the suspected microbial diagnosis.

HIS-613 Immunohistochemistry Techniques

Localization of proteins in cells of a tissue section; Use of antibodies binding to antigen in biological tissues; Immunohistochemical staining to diagnose abnormal cells in cancerous tumors; Specific molecular markers characteristic of important cellular events proliferation or death.

HIS-614 Immunofluorescent Techniques

Diagnostic application of immunofluorescent in histopathology, qualitative and quantitative detection of specific proteins in cells, culture, tissues, on microbeads and microarrays using fluorescence microscopy.

HIS-615 Cytology and Cytological Techniques in Non-Gynecology

Demonstration of benign and malignant changes on cells in non-gynecology; Cytological techniques used to demonstrate the changes on the cell under different circumstances.

HIS-616 Cytology and Cytological Techniques in Gynecology

Demonstration of benign and malignant changes on the cells in female genital tract; Cytological techniques used to demonstrate the changes on the female genital tract under different circumstances.

HIS-621 Histopathological Diagnosis

Selection of apt techniques for diagnosis of lesions and diseases in various body regions; Microscopic manifestations of acute and chronic inflammation; Appearance of necrosis, fibrosis, cancer, healing and repair.

HIS-622 Cytogenetic and Molecular Techniques

Laboratory techniques and instrumentation for exploring cells genetics: Chromosomes (Cytogenetic), DNA and RNA (Molecular Genetics); Human specimens for investigations: blood, amniotic fluid, bone marrow, tumors and fibroblasts (including fetal tissue); Laboratory tests and procedures to provide critical information for accurate diagnosis, treat and monitor of patient's condition.

HIS-623 Tissue Transplantation Technology

Human organ transplantation; Careful monitoring of donors and recipients; donors / recipients compliance; Donor candidate selection: timing and careful management of patients waiting for transplanting; Rapid tests for evaluation and screening of donated organs . Matching of “extended criteria” of donors with appropriate recipients; Quantifying risks related to receiving organs; Government role in organs transplanting: regulations; support services.

HIS-624 Cell Culture Technology

Cell culture techniques with mammalian cell lines; Cells grown in culture; Methods for transforming and separating cells; Tissue culturing; Cell metabolism; Aging process; Effects of drugs and toxic compounds on the cells: mutagenesis and carcinogenesis.

HIS-625 Stem Cell Technology

Advanced histological techniques and immunocytochemistry; Identification of stem cells in human and animals; Instruction in theory and practical of the Procedures for identifying stem cells in different stages.

HIS-626 In-vitro Fertilization Technology

Core knowledge in the fundamental principles of reproductive science ;and the application of essential laboratory techniques in IVF ; Introduction and definitions; Concepts and principles of reproductive science; Application of essential laboratory techniques in IVF; Procedures for removing ova from ovary; Ova / sperms fertilization procedure in laboratory; Transfer of fertilized embryo (egg) to uterus.

HIS-631 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Award of the degree

The Scientific Council of the National University, based on the of recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

M.Sc. Medical Laboratory Sciences Histopathology and Cytology

(3) M.Sc. Medical Laboratory Sciences Microbiology and Infection Control

Specific objectives

The program qualifies the candidates to:

- Describe microorganisms' (bacteria, viruses and fungi) cell structures, nutrient requirements and metabolism.
- Use methods of sterilization and test their efficacy.
- Perform serological tests for diagnosis of bacterial, fungal and viral infections using the available laboratory facilities.
- Isolate and identify the pathogenic microorganisms and test their susceptibility to antibiotics.
- Determine the minimum inhibitory concentrations of antibiotics in body fluids.
- Adopt appropriate safety measures and maintain quality control in microbiology labs.
- Apply infection control program in hospitals and medical labs.

Learning outcomes

Upon graduation students will acquire:

- Advanced knowledge on bacteriology, mycology, virology, and immunology.
- Advanced practical skills for specimens' collection, diagnosis and identifying appropriate antibiotics for treatment of infections.
- Basic and advanced knowledge and skills on infection control.

Admission requirements

- Applicants must satisfy the general regulations set by the Faculty of Graduate Studies and Scientific Research of the National University- Sudan for registration for master degrees.
- Eligible candidates are holders of:
 - (A) B.Sc. (Honors) in Medical Laboratory Sciences in: Microbiology from the National University or from an equivalent university or a college.
 - (b) B.Sc. Medical Laboratory Sciences in Microbiology plus qualifying or postgraduate diploma from the National University or from an equivalent university or a college.

Study program

Semester One

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
MIC-611	Medical Microbiology	3(2+1)	2	2
MIC-612	General Bacteriology	3(2+1)	2	2
MIC-613	Medical Mycology	4(3+1)	3	2
MIC-614	Diagnostic Virology	4(2+2)	2	4
MIC-615	Basic Infection Control	4(4+0)	4	0

Semester Two

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
MIC-621	Systemic Bacteriology	4(2+2)	2	4
MIC-622	Clinical Virology	4(4+0)	4	0
MIC-623	Advanced Techniques in Bacteriology	4(2+2)	2	4
MIC-624	Diagnostic Molecular Techniques in Microbiology	2(1+1)	1	2
MIC-625	Advanced Infection Control	4(3+1)	3	2

Semester Three

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
MIC-631	Dissertation	8(0+8)	0	16

Courses contents

MIC-611 Medical Microbiology

History of microbiology, taxonomy, growth, metabolism types of bacteria; Bacterial cell structure and physiology; Basic methods for isolation and identification of bacteria; Methods of sterilization and disinfection.

MIC-612 General Bacteriology

New techniques of microbiology: taxonomy, growth, metabolism types of bacteria; Bacterial cell structure and physiology; Basic methods for isolation and identification of bacteria; Methods sterilization and disinfection.

MIC-613 Medical Mycology

Examine the biology of true fungi and other organisms traditionally classified with the fungi: taxonomy, life history traits, ecology, physiology, and pathogenesis; Types of mycoses and evolutionary biology of major classes and orders of fungi; Impact of fungi on humans ; Identification of fungi in microbiology lab.

MIC-614 Diagnostic Virology

Definition, morphology, structure, replication, classification, and ways of causing viral diseases; Type of specimens taken for laboratory diagnosis; Methods for isolation of viruses: cell cultures, electron microscopy, serological and molecular.

MIC-615 Basic Infection Control

Sources of infection in the community and health institutions; Medical facilities; Disinfection and sterilization; Hand hygiene; Personal protective equipment; Contagious and contaminating materials; organisms transmitted from contacts with contaminated materials; Identifying potential sources of infection in laboratory.

MIC-621 Systemic Bacteriology

Systemic infections; mechanism; path physiology; etiological agents and protocol of diagnosis; Specimens: collection and preservation; diagnosis techniques in bacteriology laboratories.

MIC-622 Clinical Virology

Description of clinical entities; Laboratory diagnosis; Prevention and control of some viral diseases: hepatitis, influenza, herpes, polio-AIDs and association with systemic infections.

MIC-623 Advanced Techniques in Bacteriology

Machines and advanced techniques for isolation and identification of bacterias; Antimicrobial sensitivity tests; Detection of resistant strains; use of molecular techniques for specific isolation of pathogenic bacteria.

MIC-624 Diagnostic Molecular Techniques in Microbiology

Machines and advanced techniques for molecular isolation and identification of microorganisms ;
Detection of resistant strains using molecular techniques for specific isolation of microorganisms

MIC-625 Advanced Infection Control

Sources of infection in communities; Types and sources of spreading pathogens; Outbreaks, surveillance and reporting of diseases; Basic knowledge on epidemiology apply effective infection control.

MIC-631 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Award of the degree

The Scientific Council of the National University, based on the of recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**M.Sc. Medical Laboratory Sciences
Microbiology and Infection Control**

**(4) M.Sc. Medical Laboratory Sciences
Parasitology and Medical Entomology**

Specific objectives

The program qualifies the candidates to:

- Acquire advanced knowledge in Parasitology, Medical entomology, Immunology and Molecular Parasitology.
- Identify human parasites, vectors and their relationships.

Learning outcomes

Upon graduation from the program, students will be able to:

- Perform parasitological tests for specimens in Parasitology lab.
- Apply serological and molecular techniques for lab diagnosis of parasites.
- Appropriately handle and manage experimental animals.

Admission requirements

- Applicants must satisfy the general regulations set by the Faculty of Graduate Studies and Scientific Research of the National University- Sudan for registration for master degrees.
- Eligible candidates are holders of:
 - (a) B.Sc. (Honors) in Medical Laboratory Sciences in: Parasitology from the National University or from an equivalent university or a college.
 - (b) B.Sc. Medical Laboratory Sciences in Parasitology plus qualifying or postgraduate diploma from the National University or from an equivalent university or a college.

Study program

Semester One

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
PAR-611	Biology and Metabolism of Parasites	3 (2+1)	2	2
PAR-612	Protozoology	3 (2+1)	2	2
PAR-613	Medical Entomology	3 (2+1)	2	2
PAR-614	Diagnostic Parasitological Techniques I	3 (2+1)	2	2
PAR-615	Experimental Parasitology	3 (2+1)	2	2
PAR-616	Evidence Based Practices in Parasitology	3 (3+0)	3	0

Semester Two

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
PAR-621	Helminthology	3 (2+1)	2	2
PAR-622	Immunoparasitology	3 (2+1)	2	2
PAR-623	Diagnostic Parasitological Techniques II	3 (2+1)	2	2
PAR-624	Advanced Parasitological Techniques	3 (2+1)	2	2
PAR-625	Molecular Parasitology	3 (2+1)	2	2
PAR-626	Epidemiology of Parasitic Diseases	3 (2+1)	2	2

Semester Three

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
PAR-631	Dissertation	8(0+8)	0	16

Courses contents

PAR-611 Biology and Metabolism of Parasites

Description of the structure of the cellular properties, function and the chemical element of the parasite system especially protozoa; nutrition reproduction and metabolism of parasites and their ability to cause diseases.

PAR-612 Protozoology

Epidemiology: pathogenicity and management of protozoan infections; Archaeological evidence of protozoan infections; Biology of protozoan; Mode of transmission of parasitic infections; Diagnosis of protozoan infections; Protozoan infection and immune compromised host; Molecular genetics of malaria; Treatment options for protozoan infections; Mechanisms of anti-malarial drugs; Drug action and drug resistance; Current and potential approaches for protozoan infections control.

PAR-613 Medical Entomology

Concepts associated with vector-borne diseases and demographic and descriptive epidemiology; Overview of Medical Entomology; Trends in the evolution of arthropod vectors of diseases; Anthroozoonotic diseases; Venomous arthropods and their associated problems , psychogenic

parasitosis; Application of Molecular Biology; Immunology and bioinformatics; Pesticides used in control of vectors; Forensic entomology.

PAR-614 Diagnostic Parasitological Techniques 1

Quality control in parasitology laboratory; Principles of light microscope; Principles of electron microscope; Principles of fluorescent microscope; Smears preparation and examination.

PAR-615 Experimental Parasitology

Handle and dissects lab models; Collection and inoculation of blood and other materials; Vaccination; Drug screening.

PAR-616 Evidence Based Practices in Parasitology

Research evidence; Posing the right questions; Searching the literature; Critical appraisal of the literature; Qualitative research appraisal; Systematic review; Meta-analysis, Developing evidence-based culture; Clinical evidence changing laboratory practice.

PAR-621 Helminthology

Overview of Medical Helminthology; Biology of helminthes; Patterns of larval development; Epidemiology and conditions leading to helminthic infections; Mode of transmission of helminthes infections; Impact of helminthic infections on human health; Role of immune system in producing the disease in helminthic infections; Tropical pulmonary eosinophilia; Common helminthic infections in children; Impact of helminthes co-infections with other parasitic infections; Diagnosis of helminthes; Diagnosis: light Microscope examination, immunological : ELISA and PCR.

PAR-622 Immunoparasitology

Immunological events during parasitic infection; Types of immune response and the main antigens of each parasite; cells involved in immune response; Escaping mechanism of the parasite; Immuno-pathology of the parasite; Basis of antigen preparation for parasitological uses; Principles of immunological techniques; Vaccination and prevention mechanism of parasitic infections.

PAR-623 Diagnostic Parasitological Techniques II

Advanced parasitological techniques; cultivation and preservation methods used to diagnose and / or maintain parasites of medical importance.

PAR-624 Advanced Parasitological Techniques

Collection, preservation and transport of specimens; Detection and identification of parasites; Recording results; Fixatives used to preserve parasitic elements in faces; Identification of adult intestinal worms.

PAR-625 Molecular Parasitology

Parasite genome structure and expression; Antigenic variability; genetics epidemiology and host-parasite interactions; Current molecular techniques used for identification of certain parasites: plasmodium, leishmania, trypanosoma, toxoplasma and schistosoma.

PAR-626 Epidemiology of Parasitic Diseases

Definition, nature and uses of epidemiology; Basic epidemiologic concepts; epidemiological terminology; Basic epidemiological studies.

PAR-631 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Award of the degree

The Scientific Council of the National University, based on the recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**M.Sc. Medical Laboratory Sciences
Parasitology and Medical Entomology**

**(5) M.Sc. Medical Laboratory Sciences
Chemical Pathology**

Specific objectives

The program qualifies the candidates to:

- Acquire state of the art chemical pathology knowledge
- Develop apt skills to undertake routine quality control in chemical pathology laboratories.
- Generate biological and diagnostic reagents.
- Maintain laboratory equipment in chemical pathology laboratories.

Learning outcomes

Upon completion of the program, successful candidate should be able to:

- Apply safety and abide by governmental regulations and standards of medical laboratory practices.
- Operate and maintain laboratory equipment used in chemical pathology labs.
- Assure quality program in chemical pathology labs.
- Perform routine and advanced biochemical tests in chemical pathology labs.

Admission requirements

- Applicants must satisfy the general regulations set by the Faculty of Graduate Studies and Scientific Research of the National University-Sudan for registration for master degrees.
- Eligible candidates are holders of:
 - (A) B.Sc. (Honors) in Medical Laboratory Sciences in: Chemical Pathology from the National University or from an equivalent university or a college.
 - (b) B.Sc. Medical Laboratory Sciences in Chemical Pathology plus qualifying or postgraduate diploma from the National University or from an equivalent university or a college.

Study program

Semester One

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
CHM-611	Laboratory Procedures in Chemical Pathology	3(2+1)	2	2
CHM-612	Instrumentations in Chemical Pathology	3(2+1)	2	2
CHM-613	Quality Control in Chemical Pathology	3(2+1)	2	2
CHM-614	Body Fluids	3(2+1)	2	2
CHM-615	Biochemical Changes in Metabolic Diseases	3(2+1)	2	2
CHM-616	Biochemical Changes in Renal Diseases	3(2+1)	2	2

Semester Two

Code	Course	Credit hours	Contact hours/Week	
			Theory	Practical
CHM-621	Endocrinology and Enzymology	3(2+1)	2	2
CHM-622	Biochemical Changes in Liver and Gastrointestinal Tract Diseases	3(2+1)	2	2
CHM-623	Toxicology, Therapeutic Drugs Monitoring and Tumors Markers	3(2+1)	2	2
CHM-624	Nutritional Assessment: Vitamins and Trace Elements	3(2+1)	2	2
CHM-625	Pregnancy, Inborn Errors of Metabolism and Neonatal Screening	3(2+1)	2	2
CHM-626	Diagnostic Molecular Techniques in Chemical pathology	3(2+1)	2	2

Semester Three

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
CHM-631	Dissertation	8(0+8)	0	16

Courses contents

CHM-611 Laboratory Procedures in Chemical Pathology

Define chemical pathology terms; Hazards in chemical pathology laboratories; Identify units of measurement; Use of glassware in chemical pathology laboratories; Preparation of solutions from solid substances and from stock solutions; Methods of concentration: molarity, normality and percentage; Methods of collection, storage and transport of specimens in chemical pathology laboratories; Types of anticoagulants in chemical pathology.

CHM-612 Instrumentations in Chemical Pathology

Operating instruments in chemical pathology laboratories; Interpretation of results of: flame spectrophotometer, immunofluorescence, automated chemical analyzer, electrophoresis, ELISA, PCR, gas analyzers, and chromatography.

CHM-613 Quality Control in Chemical Pathology

Purpose of quality control program; Steps of quality assurance; Preparation of control materials and standard operating procedures; Documentation of results: calibration, performance, maintenance checks, malfunctions, and corrections.

CHM-614 Body Fluids

Body fluid compartments: composition and measurements; General characteristics of CSF, synovial, amniotic and peritoneal fluid.

CHM-615 Biochemical Changes in Metabolic Diseases

Measurement and metabolism of carbohydrates, amino acids, proteins and lipids

CHM-616 Biochemical Changes in Renal Diseases

Renal anatomy and physiology; Urine formation; Urinalysis; Abnormalities of renal function: nephritis and nephritic syndromes; Renal failure and renal stones.

CHM-621 Endocrinology and Enzymology

Use of enzymes in diagnosis; Classification of enzymes; Enzymatic kinetics; Enzyme profiles in disease: liver, bone, prostate, muscle and heart; Use of enzymes as analytical reagents; Biosynthesis; Chemistry and physiological function of hormones and inborn errors of hormones

metabolism; Endocrine glands: hypothalamic-pituitary-adrenal axis, thyroid, parathyroid, adrenal (cortex, medulla) and gonads.

CHM-622 Biochemical Changes in Liver and Gastrointestinal Tract Diseases

Measurement of bilirubi: total protiens, albumin and liver enzymes: AST, ALT, ALP, GGT and 5NT in liver disorders.

CHM-623 Toxicology, Therapeutic Drugs Monitoring and Tumors Markers

Applied toxicology; Measure of drugs in the blood; Identification of tumors markers types.

CHM-624 Nutritional Assessment: Vitamins and Trace Elements

Classification and functions of vitamins and trace elements; Vitamin deficiency disorders and vitamins overdose; importance of trace elements.

CHM-625 Pregnancy, Inborn Errors of Metabolism and Neonatal Screening

Types, causes and laboratory tests of inborn errors of metabolism; Screening tests of neonates ; laboratory investigations of pregnancy.

CHM-626 Diagnostic Molecular Techniques in Chemical Pathology

Define diagnostic molecular biology; Role of molecular biology in chemical pathology laboratories; Identify molecular techniques in chemical pathology; Applications of molecular techniques in diagnosis of chemical changes in body fluids.

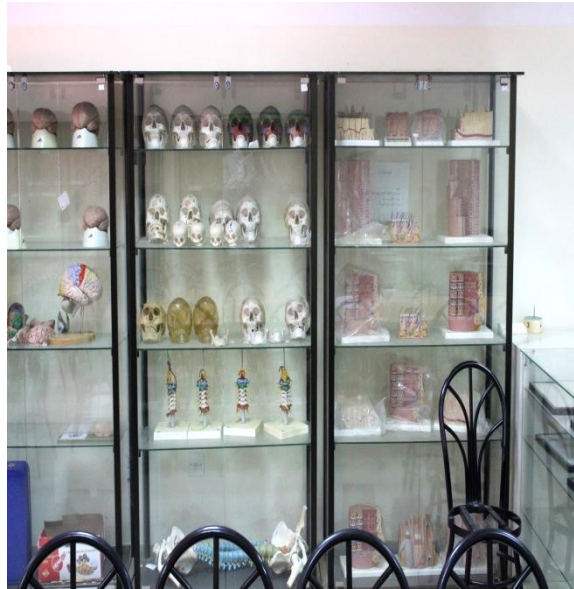
CHM-631 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Award of the degree

The Scientific Council of the National University, based on the of recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

**M.Sc. Medical Laboratory Sciences
Chemical Pathology**



(C)

Faculty of Medicine



M.Sc. Human Clinical Anatomy

Introduction

Human Clinical Anatomy is an advanced postgraduate program designed for students seeking an in depth understanding of structures and functions of human body using macroscopic, microscopic and radiographic techniques. Sudan witnesses an acute shortage in qualified staff specialized in human anatomy due to a continuous brain drain to the neighboring countries. For this the program targets qualifying a critical mass of specialists in Human Clinical Anatomy to work in universities, research centers and in forensic medicine facilities. The program strictly abides by ethics and regulations to conserve the rights and privacies of humans.

General objective

Bridge the gap in qualified staff in the field of Clinical Human Anatomy.

Specific objectives

The program qualifies candidates to:

- Know morphology, organization, and anatomical relations of the human body systems and organs: Gross anatomy.
- Know the structure and development of the human body systems: Histology and embryology
- Identify structures in imaging investigations
- Correlate clinical problems to normal anatomy
- Conduct technical research in human body systems: structures and development.

Expected learning outcomes

By the end of the program, the candidate should be able to:

- Skillfully dissect human body.
- Interpret and care for anatomical specimens.
- Identify the normal anatomical structures in imaging modalities.
- Identify the histological structures of humans.
- Conduct research, analyze data, organize and interpret results related to human health.
- Follow the development process of the human of critical embryonic period and determine congenital anomalies.

Admission requirements

- Applicant must satisfy the general regulations set by the faculty of graduate studies and scientific research of National University for registration for master degrees.
- Eligible applicants are holders of Bachelors degrees with grade good minimum or cGPA ≥ 2.5 from the National University or any other accredited university or a college in the following:
 - MBBS.
 - Basic Medical Sciences majoring human anatomy
 - Veterinary Medicine

- Dentistry
- Nursing
- Radiography
- Physiotherapy
- All eligible candidates should pass an interview and an entry examination.

Study program

Semester One

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
HCA-611	Principles of Medical Education	2(1+1)	1	4
HCA-612	Cells and Tissues	3(2+1)	2	4
HCA-613	Developmental Anatomy	2(1+1)	1	4
HCA-614	Integumentary System	2(1+1)	1	4
HCA-615	Respiratory System	3(2+1)	2	4

Semester Two

Code	Course	Credit hours	Contact hours/ week	
			Theory	Practical
HCA-621	Musculoskeletal System	3(2+1)	2	4
HCA-622	Cardiovascular and Lymphatic Systems	3(2+1)	2	4
HCA-623	Digestive System	3(2+1)	2	4
HCA-624	Urinary System	2(1+1)	1	4
HCA-625	Reproductive System	2(1+1)	1	4

Semester Three

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
HCA-631	Endocrine System	2(1+1)	1	4
HCA-632	Head and Neck	2(1+1)	1	4
HCA-633	Nervous System	6(4+2)	4	8
HCA-634	Special Senses	2(1+1)	1	4

Semester Four

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
HCA-641	Research Methodology	2(1+1)	1	4
HCA-642	Dissection	6(1+5)	1	20
HCA-643	Dissertation	3(0+3)	0	12

Courses Contents

HCA-611 Principles of Medical Education

Principles of learning; Instructional methods and techniques used in university education; Methods of assessment and evaluation of: programs, students and instructors; Problem-based learning; Present lectures in the proper way and observe all aspects mentioned in the seminar evaluation From SC-FR, Issue/Rv. (02/00);_Evaluation: integration of structure, function, dysfunction and rehabilitation; Anatomical and physiological terminologies; Imaging modalities and techniques.

HCA-612 Cells and Tissues

Functions of assigned cell organelles; Major compartments of body fluids; Divisions and components of the body; Four Basic tissues; Structures, features and functions of: epithelial, connective, muscular, and nervous tissues.

HCA-613 Developmental Anatomy

Fertilization and cleavage; Blastocyst: Features and developmental fate; Implantation; Embryogenesis and fate of the three primary germ layers; Embryonic membranes and functions; Placenta formation and function; Changes in maternal anatomy and physiological consequences during pregnancy: teratogenes, congenital and chromosomal abnormalities.

HCA-614 Integumentary System

Organs comprising Integumentary system gross: Histological, ultramicroscopic features and functions; Epidermis layers and cell types; Thick and thin skins; Dermis Structure; Dermal capillary networks; Skin color and pigments; Hair and nails structures.

HCA-615 Respiratory System

Osseous and cartilaginous components of ribs and thoracic vertebrae; Intercostal muscles and intercostal spaces; Intercostal nerves and vessels; Sternum and its ossification; Diaphragm morphology; Respiratory system anatomical divisions and functions; Internal and external nose; Pharynx; Larynx and its cartilages; Trachea; lung lobes and fissures; Bronchial tree; Alveoli; Pleura: reflections, recesses and spaces; Histological changes from nose to alveolus; Lungs blood and nerve supply ; Lungs lymphatic drainage; Development of respiratory system; Thoracic wall bony landmarks and surface projections.

HCA-621 Musculo-Skeletal System

- (a) **Bones and Joints :** Typical long bone: blood and nerve supply; Histology of compact and spongy bone; Intramembranous and endochondral ossification; Layers of epiphyseal plate; Adjacent nerves and vessels; Common fractures sites; Interstitial and
- (b) **Appositional Growth;** Bone remodeling; Sesamoid and sutural bone; Structural categories of joints; Joint mobility; Simple synovial joints and subcategories; Cartelgenous and fibrous joints; Bones and joint imaging.
- (c) **Muscles:** Functions and properties of muscles tissues; Skeletal muscles: origin and insertion, nerve and blood supply, growth and regeneration; Lever systems; Muscles working in groups; Histology of skeletal, cardiac and smooth muscles.
- (d) **Vertebral Column:** Typical and atypical vertebrae features; Regions of vertebral column; Number of vertebrae in: cervical, thoracic, lumbar, sacral and coccygeal regions; Intervertebral joints; Intervertebral disc; Major ligaments connecting vertebrae; Normal spinal curve; Vertebral column curvatures; Development of vertebral column; Spinal muscles: superficial, deep layers of the back and cervical region; Vertebral column imaging.
- (e) **Shoulder Girdle and Upper Limb:**
Shoulder girdle components; Upper limb Osseous components: Scapula, humerus, radius, ulna, wrist and hand; Shoulder, elbow, wrist and other joints; Rotator cuff components;, Shoulder and pectoral regions: bones, cartilages, and connective tissues; Muscles responsible for shoulder joint movement and their innervations;
Shoulder girdle and upper limb bones surface projections; Axilla and cubital fossa contents; Brachial plexus: roots, trunks, cords and branches; Arm and forearm muscular compartments: Nerve supply actions and disorders; Upper limb blood supply and lymph drainage; Upper limb imaging.
- (f) **Pelvic Girdle and Lower Limb**
Components of pelvic bones; Proximal femur and hip joint with associated ligaments and joint capsule; Osseous components of femur; Tibia, fibula and foot; Male and female pelvis; Arches of

foot; Knee joint structures; Muscles groups in gluteal region: thigh, leg and foot; Surface projections of pelvic girdle and lower limb bones; Lower limb blood supply and lymph drainage; Lower limb imaging; Ankle joint; Femoral triangle and popliteal fossa; Foot layers; Lumbar and lumbosacral plexuses.

HCA-622 Cardiovascular System and Lymphatic System

(a) Cardiovascular System

Heart: Position, borders, surfaces , external and internal features; Atria ,ventricles valves and major blood vessels; Heart wall layers; Blood and nerve supply of the heart; Mediastinum boundaries and divisions; Pericardium: Layers, blood and nerve supply and pericardial sinuses; Major arteries and their branches , large veins and their tributaries , Development and congenital anomalies of heart and major blood vessels and circulation; Histology of heart and blood vessels; imaging of cardiovascular system.

(b) Lymphatic System

Lymphatic system structural components and functions; Thoracic and right lymphatic ducts; Location, structure and function of primary and secondary lymph organs; Lymph nodes, lymphatic nodules and lymphatic organs.

HCA-623 Digestive System

Anterior abdominal wall muscles: division , regions and quadrants; Innervation and action of the anterior abdominal wall muscles; Development and gross features of peritoneum; visceral and parietal peritoneum; Peritoneal folds and spaces seen; Digestive tube layers; Oral cavity: boundaries and contents; Tooth structure and types ; salivary glands; esophagus; stomach; small intestine; large intestine, anal canal and anus; Liver and biliary tree; Pancreas and pancreatic duct system; Development of digestive tract and anomalies; Blood supply and lymphatic drainage of gastrointestinal tract.

HCA-624 Urinary System

Urinary organs: location, relations, coverings, internal and external features, innervations, blood supply; kidneys ; ureters; bladder ; urethra; internal and external urethral sphincters; Histology of urinary system; Development and congenital anomalies of the urinary organs; imaging of urinary system.

HCA-625 Reproductive System

Male and female pelvis; Peritoneal reflections around pelvic cavity; Pelvic diaphragm; , Male internal and external genital organs: gonads, prostate, seminal vesicles, ejaculatory duct, scrotum, spermatic cord, penis; Female internal and external genital organs: gonads, uterus, uterine tubes, vagina; Perineum; Development and congenital anomalies of male and female genital systems; Histology of males and females genital system; Reproductive system imaging.

HCA-631 Endocrine System

Endocrine glands: position, relations, blood supply, nerve supply and structure; Hypothalamus; Pituitary; Pineal; Thyroid; Parathyroid; Adrenal; Endocrine portion of the pancreas; Endocrine portions of the gonads; Development and congenital anomalies of endocrine system; Imaging of the endocrine glands.

HCA-632 Head and Neck

Skull and mandible; Cervical vertebrae; Fascia and Triangles of the neck; Root and viscera of the neck; Face and scalp; Boundaries and contents of : temporal, infra-temporal and pterygopalatine fossae; Oral cavity, TMJ and salivary glands; Pharynx; Larynx; Nose; Para-nasal sinuses; eye; ear; Head and neck: blood vessels and nerves; Lymphatic drainage.

HCA-633 Nervous System

Topography of Nervous system; Divisions of nervous system; Development of Nervous system; Histology of Nervous system; Spinal cord; Ascending and descending tracts; Brain stem; Diencephalon; Cortex and cortical areas; Basal ganglion; Cerebellum; Meninges; CSF and ventricular system; Blood supply of brain and spinal cord; Cranial nerves.

HCA-634 Special Senses

Sensation and perception; Sensory modality; Sensory receptors; General and special senses, Structure of ear; Vestibular and cochlear pathway; Eye, eyeball structures and Visual pathway; olfactory epithelium and olfactory pathway; Taste sensation and gustatory pathway

HCA-641 Research Methodology

Research concepts; Types of research; Literature review; Identifying a research problem; Research hypotheses; Writing a research proposal; Design of experiments; Sampling procedures; Data collection and analysis; Interpretation of results; Writing a research report, dissertation or thesis.

HCA-642 Dissection

In-depth dissection of the head and neck, thorax, abdomen, pelvis and perineum, upper and lower limbs on the cadaver; Detailed dissection of a specific region of human body on cadavers

HCA-643 Dissertation

Write research proposal; Conduct piece of research: Design of experiments, questionnaire, and Data collection: Organization, analyses, interpretation and presentation; Dissertation writing: Abstract, introduction, literature review, materials and methods, results and discussion, conclusions and recommendations references; Dissertation assessment.

Human resources and facilities

Teaching staff: Two professors
Three associate professors
Three assistant professors
Five lecturers
Two laboratory technologists

Facilities

Lecture rooms: One lecture room: 40 seats
Laboratories: Histology lab: 100 seats
Dissection room: 100 seats
Museum: 40 seats
Conventional and Advanced Imaging lab: 40 seats
Libraries: University main library: 400 seats.
E-Library: 250 seats.

Duration of the program: 16 months.

Teaching modules

Lectures, practical, seminars, small group discussions, tutorials, assignments, problem-based sessions, journal clubs

Teaching language: English.

Examinations regulations

- Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- A student failing any supplementary examination should repeat the course.
- Duration of the dissertation is 16 weeks. If need be, an extension of six weeks is allowed on approval of the program coordinator.
- A student scoring less than 60% in the dissertation oral examination will be allowed only one more chance.
- All students shall sit for oral and dissection examinations at the end of semester three.

Assessment:

Continuous assessment	30 %
Final examination	70%

Grading system: A⁺ (90-100) A (80-89) B⁺(75-79) B (70-74) C⁺(65-69) C(60-64) F (<60)

Award of the degree

The Scientific Council of the National University, based on the recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

M.Sc. Human Clinical Anatomy



(D)

Faculty of Clinical and Industrial Pharmacy



Master of Hospital Pharmacy

Introduction

M.Sc. Hospital Pharmacy is an advanced unique program in Sudan designed for pharmacists working in hospitals and community pharmacies to enhance their clinical pharmacy knowledge and practice skills in applying drug therapies. It deals with the application of drug treatments to patients in hospital or clinical settings. The program is strictly designed to cater for wise administration of medications to secure and ensure the safety and health of patients.

General objectives

The M.Sc. Hospital Pharmacy program prepares students for successfully executing the tasks of hospital pharmacist.

Specific objectives

The program is designed to equip the students with:

- Knowledge of characteristics, side-effects, route of administration, interactions, stability and doses of drugs used in hospitals.
- Ability to evaluate a patient's drug use in relation to the pathology.
- Skills of preparation and pharmaceutical formulation of drugs.
- Knowledge of principles of sterilization.

Expected learning outcomes

Upon graduation from the program, students will be able to:

- Choose, prepare, store, compound, and dispense medicines and medical devices.
- Advise healthcare professionals and patients on safe, effective and efficient use of drugs.
- Provide services to patients and health care professionals in hospitals.
- Provide pharmaceutical services for hospitals and hospital pharmacists.
- Manage complex clinical problems.

Admission requirements

- Applicant must satisfy the general regulations set by the faculty of graduate studies and scientific research of the National University-Sudan for registration for master degrees.
- Eligible candidates are:
 - (a) Holders of B.Sc. Pharmacy from the National University-Sudan.
 - (b) Holders of B.Sc. Pharmacy from any other accredited university or a college with grade Good minimum or with cGPA 2.5 out of 4.0 or cGPA 3.00 out of 5.0.
 - (c) Priority is reserved for candidates working in hospitals.

Study program

Semester One

Code	Course	Credit Hours	Contact Hours	
			Theory	Practical
MCH-611	Research Methodology	2(2+0)	2	0
MCH-612	Biostatistics	2(2+0)	2	0
MCH-613	Pharmacoinformatics and Communication Skills	2(2+0)	2	0
MCH-614	Pharmacoepidemiology	2(2+0)	2	0
MCH-615	Molecular Pharmacology	2(2+0)	2	0
MCH-616	Pharmacotherapy in Patient Care	2(2+0)	2	0

Semester Two

Code	Course	Credit Hours	Contact hours)	
			Theory	Practical
MCH-621	Hospital Pharmacy Services	2(2+0)	2	0
MCH-622	Pharmacoeconomics and Hospital Supply Management	2(2+0)	2	0
MCH-623	Dosage Form Design and Biopharmaceutics	2(2+0)	2	0
MCH-624	Pharmaceutical Chemistry and Analysis	1(1+0)	1	0
MCH-625	Advanced Clinical Pharmacy	2(2+0)	2	0
MCH-626	Current Developments in Health and Biotechnology	1(1+0)	1	0
MCH-627	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	2(2+0)	2	0

Semester Three

Code	Course	Credit Hours	Contact hours	
			Theory	Practical
MCH-631	Clerkship of Internal Medicine: Cardiology and Pulmonary	2(1+1)	1	2
MCH-632	Clerkship of Surgery and Critical Care	1(0+1)	0	2
MCH-633	Clerkship of Endocrinology	1(0+1)	0	2
MCH-634	Clerkship of Obstetrics and Gynecology	1(0+1)	0	2
MCH-635	Clerkship of Pediatrics	1(0+1)	0	2
MCH-636	Clerkship of Psychiatric	1(0+1)	0	2
MCH-637	Clerkship of Oncology	1(0+1)	0	2
MCH-638	Clerkship of Total Parenteral Nutrition	1(0+1)	0	2
MCH-639	Clerkship of Extemporaneous Compounding	1(0+1)	0	2

Semester Four

Code	Course	Credit Hours	Contact hours)	
			Theory	Practical
MCH-641	Clinical Research	1(1+0)	1	0
MCH-642	Journal Club	1(1+0)	1	0
MCH-643	Dissertation	9(6+3)	6	6

Courses contents

MCH-611 Research Methodology

Introduction to epidemiology; Study design; Bias; Meta-analysis and critical appraisal; Experimental design; Survey methods; questionnaires, interviews, unstructured interviews, focus groups; Sampling and samples sizes; Hypothesis testing; Statistical analysis; Correlations and regression; Chi-square distribution; Analysis of variance and non-parametric statistics; Report writing.

MCH-612 Biostatistics

Variables: definition , types: dependent, independent, confounded; Measurement of variables, validity; Types of validity: internal, constructs validity, external, threats ; Types of research: observational, archival, case study, meta-analysis and critical appraisal; Experimental design: True and quasi-experiments; Survey methods: questionnaires, interviews, unstructured interviews and focus group; Types of samples: purposive, convenience and probability; Hypothesis testing; Statistical analysis; Correlation and regression; Chi-square distribution; Analysis of variance and non-parametric statistics.

MCH-613 Pharmacoinformatics and Communication Skills

Introduction to drug information resources; Query answering and documentation; Critical evaluation of drug information and literature; Primary, secondary and tertiary source; Preparation of written and verbal reports; Establishing drug information center; Poisons information-organization and information resources; Poisons management in drug dependence and drug abusers: opiates, cocaine, amphetamine, alcohols, benzodiazepines, barbiturates, tobacco; Evidence base medicines: Formulating clinical questions; searching best evidence, critical appraisal of the evidence, applying evidence to the patients, evaluation; Drug monographs.

MCH-614 Pharmacoepidemiology

Definitions of terms and aims of Pharmacoepidemiology; Outcomes of drug use measure; Systems for testing drug effects in populations; Advantages and disadvantages of Pharmacoepidemiological models; Variations in disease by: time, place and person; Sources of data: incidence, prevalence and others; Causation: bias, confounding and effect modification; Randomized controlled trials; drug trials, cohort studies, case-control studies, cross-sectional studies, hybrid designs, prescription event monitoring; Selected applications of pharmacoepidemiology: hospital pharmacoepidemiology, drug induced birth defects, vaccine safety; concept of risk, relative risk, odds ratio, absolute risk reduction, number to treat, attributable risk; Pharmacoepidemiological methods: Drug utilization review, survey of drug use, case series and reports, Drug use measures: number of prescription, prescribed daily dose, defined daily dose.

MCH-615 Molecular Pharmacology

Drug receptors and cell signaling; Agonist and antagonist action: affinity, efficacy, spare receptors Schild plots, Signal transduction mechanisms: cAMP, IP3, DAG, cGMP/NO; Molecular

biology of drug receptors; Receptors structure/function relationship; Molecular biology of ion channels; Pharmacology of smooth muscle and its autonomic input; Mechanisms causing contraction in smooth muscle; Transmitter release from autonomic nerve ganglia; Mechanisms of muscles relaxation; Clinical use of drugs acting on smooth muscles.

MCH-616 Pharmacotherapy in Patient Care

Pharmacotherapy instructions: dosage calculations, adverse reactions, drug interactions, relevant pharmacokinetics, alternative therapies and monitoring parameters; Pathophysiology and treatment of various disease state modules; Specific modules systemic pharmacology: cardiovascular (including, hypertension, chronic cardiac failure, ischemic heart disease, hyperlipidaemia); Musculoskeletal disorders: respiratory (asthma, chronic obstructive pulmonary disease) Gastrointestinal diseases; Hematological disorders; Musculoskeletal: osteoarthritis, rheumatoid arthritis, pain; General medical conditions 1-stroke, atrial fibrillation.

MCH-621 Hospital Pharmacy Services

Health Care Economics; Organization and Management Process; Quantitative Techniques for Management; Pharmacy Services Marketing; Communication and report writing in hospitals; Accounting for decision making; Financial management; Supply chain management; Hospital management control systems; Quality management in hospitals; Health care and insurance; Legal and ethical issues; Hospitals and pharmaceutical management.

MCH-622 Pharmacoeconomics and Hospital Supply Management

Terminology; Costs and outcomes used in pharmacoeconomic evaluations; Methodologies for pharmacoeconomic evaluations: case-minimization, cost benefit, cost effectiveness, cost utility, health insurance and medical insurance; Quality of Life (QOL) and Quality Adjusted Life Years (QALY); Decision analysis; Develop a systematic method for evaluating pharmacoeconomic studies; Management of drug supply and procurement; Managing medicine selection; Treatment guidelines and formulary manuals; Managing procurement; Quality assurance for pharmaceuticals; Quantifying pharmaceutical requirements; Managing tender processes; Managing distribution; Inventory management; Importation and port clearance; Transport management.

MCH-623 Dosage Form Design and Biopharmaceutics

Routes of drug administration; Concepts of biopharmaceutics; Calculation of drug doses: extemporaneous compounding of simple mixtures, basic physicochemical principles preparation of dosage forms; Introduction to basic facts related to information on liquid and solid materials; Properties of solutions; Principles of solutions formations from solutes and solvents; Factors affecting dissolution process; Disperse systems: colloids, suspensions, and emulsions; Mathematical characterization of absorption, distribution and elimination of drugs; Body compartments: one and two compartments; Pharmacokinetics parameters: half-life, T_{max} and C_{max} ; Bioavailability of drugs.

MCH-624 Pharmaceutical Chemistry and Analysis

Introduction to techniques of separation; Qualitative and quantitative analysis of pure and formulated drugs: titrimetric assays, UV-Vis spectrophotometry, infrared (IR) spectroscopy, nuclear magnetic resonance (NMR) spectroscopy and mass spectrometry; Major chemical routes of drug degradation; Strategies of drug curtail; Degradation kinetics; Drug shelf-life; Quality control for drugs and drug products: complementary medicines and associated pharmacopoeial requirements.

MCH-625 Advanced Clinical Pharmacy

Accurate and effective communication: building and maintaining effective relationships, limitations and consultation models; Medication review in patients with multiple pathology and multiple drugs; Identification, categorization and documentation of care issues and actions; Relevant sources; Utilization and limitations of medicines and patient information; Keeping medical records; Clinical management plans; Monitoring response: physical examination, modifying treatment., Use of common diagnostic aids; Legal, regulatory, ethical and professional frameworks; Professional relationships and communication with healthcare professionals and patients; Role and function of team members; Reflective practice: continuous professional development; Drug formularies: definition, purpose of formularies in promoting rational drug use, factors influencing selection of drugs formulary; Methods of implementing drug formularies; Clinical guidelines: definition, purpose, advantages, disadvantages and factors influencing validity of clinical guidelines; Guidelines development.

MCH-626 Current Developments in Health and Biotechnology

Emerging public health issues; Emerging pharmaceutical technologies; New human genome project; Genome implication on pharmacotherapy; Novel therapeutic agents for combating infectious disease; Development of novel drug delivery platforms.

MCH-627 Clinical Pharmacokinetics and Therapeutic Drug Monitoring

Maximum and minimum plasma concentration; Selecting The appropriate equation; Interpretation of primary pharmacokinetics parameters and their effect on of plasma drug concentration-time profile; Creatinine clearance; Drugs dialysis; Drug monographs: aminoglycosides, digoxin, carbamazepine, phenytoin...; Absorption and distribution kinetics; Therapeutic regimens; Individualization of therapy; Factors affecting individualization of therapy: variability, genetics, disease, age, weight and interacting drugs; Concentration monitoring; Distribution kinetics; Metabolite kinetics; Turnover concepts; Pharmacokinetics drug interactions during metabolism and excretion; Assessment of AUC; Urine data for estimation of half-life ; Estimation of absorption kinetics from plasma concentration; Distribution of drugs extensively bound to plasma proteins, Indications for TDM and protocol of TDM; Effect of renal impairment in pharmacokinetics; Effect of hepatic disease on pharmacokinetics.

MCH-631 Clerkship of Internal Medicine: Cardiology and Pulmonary

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-632 Clerkship of Surgery and Critical Care

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-633 Clerkship of Endocrinology

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-634 Clerkship of Obstetrics and Gynecology

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-635 Clerkship of Pediatrics

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-636 Clerkship of Psychiatric

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-637 Clerkship of Oncology

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-638 Clerkship of Total Parenteral Nutrition

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADR_s and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-639 Clerkship of Extemporaneous Compounding

Components of a case history; Principles of therapeutics; Disease major pathological processes; Clinical relevance of biochemical treats; Pathophysiology; Drugs used: modes of action, ADRs, and contraindications; Pharmacological and non-pharmacological management of diseases.

MCH-641 Clinical Research

Practice-based clinical research; Writing research project proposals; Ethics in research; Ethical clearance; Qualitative and quantitative researches; Data collection, management and answer clinical questions; Literature review for validity and clinical utility; Use electronic and paper based resources for patient care; Search relevant databases for current best evidence.

MCH-642 Journal Club

Formulate and answer clinical questions; Literature review for validity and clinical utility; Use electronic and paper based resources for patient care; Search relevant databases for current best evidence

MCH-643 Dissertation

Write a research proposal; Conduct a piece of research: Data collection, analysis, interpretation and presentation. Dissertation writing: abstract, introduction, literature review, methodology, results, discussion, conclusions and recommendations, references. Dissertation assessment; Dissertation oral examination

Human resources and facilities

Teaching staff: Four professors
Two associate professors
Ten assistant professors
Four lecturers

Facilities: One lecture room: 118 seats
One lecture room: 134 seats
Two computer labs: 240 seats
National university library: 400 seats
E- library: 250 seats

Duration of the program: Four semesters: 16 months.

Teaching modules

Lectures, tutorials, seminars, workshops and clinical rounds.

Teaching Language: English

Examinations regulations

- a. Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- b. A student failing in a supplementary examination(s) will be allowed to continue the study in the following semester besides re-studying the course (s) in question.

Assessment: Written examination	60 %
Seminars and tutorials	30 %
Assignments and laboratory classes	10 %

Grading system: A (80-100) B⁺ (75-79) B (70-74) C⁺ (65-69) C (60-65) F (< 60)

Award of the degree

The Scientific Council of the National University, based on the recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

Master of Hospital Pharmacy



(E)
Faculty of Radiography and Medical Imaging Sciences



General introduction

Medical Diagnostic Radiography and Diagnostic Medical Ultrasound are entry-to-practice programs. They qualify specialists in medical technology and medical sonography (ultrasound sonologists) to provide trusted accurate diagnosis for prevention and treatment of diseases. For this, the programs have adopted hands-on practical learning modules to grantee high quality services.

The modules integrate clinical applications, ultrasound physics, and sonographic identifications of: anatomy, physiology, pathology and patho-physiology of human body.

General objectives

Qualify critical mass of diagnostic radiography specialists and ultrasound sinologists to work in health care units universities and in research centers.

Admission requirements

- Satisfy the general regulations set by the faculty of graduate studies and scientific research of National University for registration for master degree.
- Eligible candidates are:
 - (a) Holders of B.Sc. Radiology Sciences in: Diagnostic Imaging, Nuclear Medicine, Radiotherapy with grade C at least and pass an interview.
 - (b) Holders of B.Sc. Radiology Sciences in: Diagnostic Imaging, Nuclear Medicine, Radiotherapy with grade C at least with cGPA 2.5, out of 4.0 or 3.5 out of 5.0 and pass an interview.

Human resource and facilities

Teaching staff: One professor
Four associate professors
Four assistant professors
Two lecturers

Facilities

Rooms: One lecture room: 42 seats

Laboratories: Radiology Lab: 15 seats

Hospitals: Alraqi University Hospital; Primary Health care (PHC); Royal Care International Hospital; Dar Elag Hospital; Alribat Teaching Hospital; Omar Sawie Hospital; Military Hospital; Antalya Medical Centre; Alemtiaz Hospital; Alneeleen Diagnostic Centre

Libraries: National University Main Library: 400 seats
E- Library: 250 seats

Duration of the program: Four semesters: 52 weeks

Teaching language: English.

Teaching modules: Lectures, Case studies, workshops.

Examination regulations

- Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- A student failing any supplementary examination should repeat the course.
- Duration of the dissertation shall be 16 weeks. If need be, an extension of 4 weeks is allowed if approved by the program coordinator.
- Exceeding the aforementioned period the student has to settle a one semester fees to allow her/him an extension of four weeks.
- Expiring the extension periods without completing the dissertation, the student shall be dismissed from the program.
- A student scoring less than 60% in the dissertation oral examination will be allowed only one chance for oral defense. In such case the student should settle 50% of one semester fees.

Assessment: Continuous assessment	25%
Mid examination	25%
Final examination	50%

Grading system: A⁺ (≥ 85) A (80- 84) B⁺ (70- 79) B (65-69) C (60-64) F (< 60)

(1) M.Sc. Medical Diagnostic Radiography

Specific objectives

The program qualifies the students to:

- Identify the normal and abnormal anatomy patterns in CT and MRI images
- Use CT and MRI instrumentations
- Employ advanced technologies in CT and MRI
- Apply quality control measures in CT and MRI
- Implement strategies to minimize the radiation dose to patients.
- Efficiently communicate with peers and other healthcare colleagues
- Conduct health and health-related researches

Expected learning outcomes

Upon completion of the program, successful graduates should be able to:

- Operate diagnostic radiographic instrumentation to optimize image quality and minimize radiation dose or other potential patient hazards
- Employ protocols and techniques associated with diagnostic and interventional radiographic examinations procedures
- Identify normal and abnormal imaging appearances within current diagnostic radiographic procedures
- Use patient information management systems.

Study program

Semester one

Code	Course	Credit hours	Contact hours	
			Theory	Practical
RAD-511	Advanced Medical Education	1(1+0)	1	0
RAD-512	Applied Anatomy	3(2+1)	2	2
RAD-513	Applied Physiology	2(1+0)	2	0
RAD-514	Applied Pathology	2(2+0)	2	0
RAD-515	CT and MRI Physics and Instrumentation	2(2+0)	2	0

Semester two

Code	Course	Credit hours	Contact hours	
			Theory	Practical
RAD-521	Applications of Computer in Radiology	2(1+1)	1	2
RAD-522	Normal Appearance of CT and MRI Investigation	2(2+0)	2	0
RAD-523	Quality Assurance and Patient Management	2(1+1)	1	2
RAD-524	Cross Sectional Anatomy	2(2+0)	2	0
RAD-525	Radiographic Pathology	2(2+0)	2	0
RAD-526	Ethics in Medical Imaging	1(1+0)	1	0
RAD-527	Clinical Applications of CT and MRI	2(0+2)	0	8

Semester Three

Code	Course	Credit hours	Contact hours	
			Theory	Practical
RAD-631	CT Scanning Procedures	3(2+1)	2	2
RAD-632	MRI Scanning Procedures	3(2+1)	2	2
RAD-633	Advanced Radiological Procedures	2(2+0)	2	0
RAD-634	Clinical Applications of CT and MRI	4(0+4)	0	12
RAD-635	Research Methodology	2(2+0)	2	0

Semester Four

Code	Course	Credit hours	Contact hours	
			Theory	Practical
RAD-641	Clinical Applications of CT and MRI	4(0+4)	0	12
RAD-642	Dissertation	4(0+4)	0	8

Courses contents

RAD-511 Advanced Medical Education

Health profession education; Adult learning theories; Learning outcomes and skills acquisition; Instructional design (models); Instructional design (micro teaching); Formative Assessment; Communication in multidisciplinary teams; Simulation in multidisciplinary teams; Purposeful assessment; Reflection and feedback; Learning portfolios and Mentorship.

RAD-512 Applied Anatomy

Cardiovascular system; lymphatic system; Respiratory system; Digestive system; Urinary system; Peritoneum; Developmental anatomy; Nervous system; General and special senses; Autonomic nervous system.

RAD-513 Applied Physiology

Homeostasis; Body fluid; Cardiac cycle; Cardiac output, blood, respiratory, platelets, renal physiology, GIT physiology, endocrine physiology, male and female genital physiology.

RAD-514 Applied Pathology

Cell Injury; Apoptosis and Necrosis; Adaptation to cell injury; Acute Inflammation; Sequel of Acute inflammation; Inflammatory mediators; Intracellular accumulation; Chronic Inflammation; Healing and repair; Neoplasia-1; Neoplasia-2; Carcinogenesis; Laboratory diagnosis of cancer; Introduction to genetics.

RAD-515 CT and MRI Physics and Instrumentation

Computed tomography: Physical principle and clinical applications; CT image quality; Image manipulation; Image reconstruction; Image artifact; Pitch; CT dose; Effect CT and MRI machines parameter in image contrast; Quality control in CT and MRI; Physical principles of MRI: Excitation, relaxation and processing; MRI equipment; Pulse sequence-1; Pulse sequence 2; Image quality and contrast; Factors affecting image quality; MRI artifacts; MR safety.

RAD-521 Applications of Computer in Radiology

Introduction to computer and program flow chart; Computerized tomography image formation; Magnetic resonance image formation; Application of computer in Nuclear Medicine (planner, SPECT and PET); Ultrasound image formation; Introduction to image processing (Digital image, enhancement and texture analysis).

RAD-522 Normal Appearance of CT and MRI Investigation

Introduction; Plane evaluation in CT and MRI; Normal radiographic anatomy CT and MRI of: brain , neck, chest upper abdomen, abdomen, male and female pelvis, knee and ankle joints femur and legs, upper limb, breast upper limb, breast.

RAD-523 Quality Assurance and Patient Management

Definition Quality control; Quality assurance and six sigma; Radiation protection measures in radiology department; of Image quality tests; Parameters to be checked in ultrasound unit, CT unit, and MRI scanner; Measure Quality in Radiology; Factors causing image problems.

RAD-524 Cross Sectional Anatomy

Introduction; Plan evaluation in human anatomy; Cross section anatomy of: brain, neck, chest, upper abdomen, abdomen, male and female pelvis, knee and ankle joints, femur and legs, upper limb, breast, lower limb.

RAD-525 Radiographic Pathology

General concepts; Making best use of radiology; Acute abdomen, Abdomen and hepatic biliary systems; Bone pathology and tumors; Chest pathology; Cardiovascular pathology; GIT disorder; Haemodynamic disorders; Musculoskeletal; Urinary pathology; Central nervous system pathology; Inflammatory and metabolic disorders; Gynecological pathology.

RAD-526 Ethics in Medical Imaging

Introduction to Ethics; Medico-legal Issues in Radiology; Principle of ethics; ARRT Standards of Ethics; Confidentiality; Informed consent and Negligence.

RAD-527 Clinical Applications of CT and MRI

Equipment and accessories of CT and MRI; Safety and precautions measures in CT and MRI; Warm up (CT); Scheduling cases; Positioning of patient and CT and MRI protocols; Routine investigations and special protocols; Contrast agent of CT and MRI.

RAD-631 CT Scanning Procedures

Introduction to technique; Brain; Chest; Abdomen; Pelvis; Ischemic stroke protocol and soft tissue of neck; Contrast agents; COW (Brain Angio) Sinuses+IAC protocols; CT radiation dose; CT spines and limbs; CT artifacts and Patient's care in CT.

RAD-632 MRI Scanning Procedures

Introduction; Parameters and trade-offs; Head and neck; Chest and mediastinum; Abdomen and liver protocol; Pelvis (Male and Female); Soft tissue of neck MRI; Knee and Ankle MRI; Posterior fossa and internal auditory meatus; PNS; Thyroid and parathyroid gland; MRI safety; MRCP; Cardiac MRI; Breast; TMJ and vascular imaging; Spine; Musculoskeletal; Thymus; Upper and lower limbs.

RAD-633 Advanced Radiological Procedures

Cardiac imaging (CT, MRI); Virtual colonoscopy; Entrography and entroclysis; MRS; FMRI.

RAD-634 Clinical Applications of CT and MRI

Advanced protocol in CT and MRI; CT and MRI angiographic protocols; Cardiac investigations; Pediatric scan.

RAD-635 Research Methodology

General layout of thesis; Definitions and importance of research; Characteristics of research; Classification of health research; Criteria of a research topic and selection; Introduction (problem of the study, objective, significance and overview); Literature review (theoretical background and previous studies); Materials and methods (materials, design, population, sample, method of data collection and analysis, ethical approval); Research proposal; Results; Discussion and conclusions; References citation and bibliography; Central tendency and dispersion; Association; Significance tests; Statistical decision theory.

RAD-641 Clinical Applications of CT and MRI

Diagnostic medical imaging management; CT and MRI routine and advanced Investigations; Emergency CT scan.

RAD-642 Dissertation

Scientific writing of dissertation: Preliminaries; Introduction; Literature Review; Materials and Methods; Results; Discussion; References; Appendices.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

M.Sc. Medical Diagnostic Radiography

(2) M.Sc. Diagnostic Medical Ultrasound

Specific objectives

The program qualifies the students to:

- Identify the normal and abnormal anatomy patterns in Ultrasound images
- Use Ultrasound instrumentations
- Utilize advanced technologies in Ultrasound
- Apply quality control measures in Ultrasound
- Implement strategies to minimize Ultrasound dose to patients.
- Efficiently teach, learn and communicate with peers and other healthcare colleagues.
- Conduct health and health-related research.

Expected learning outcomes

Upon completion of the program, successful graduates should be able to:

- Provide physician with apt anatomic, pathologic, and/or physiologic reports.
- Record, analyze, and process diagnostic data and other pertinent observations made during the Ultrasound exam.
- Demonstrate appropriate communication skills with patients and colleagues;
- Behave in a professional and ethical manner;
- Apply good health Ultrasound practices.

Study program

Semester One

Code	Course	Credit hours	Contact hours	
			Theory	Practical
US-511	Advanced Medical Education	1(1+0)	1	0
US-512	Applied Anatomy	3(2+1)	2	2
US-513	Applied Physiology	2(1+0)	2	0
US-514	Applied Pathology	2(2+0)	2	0
US-515	Ultrasound Physics and Instrumentation	2(2+0)	2	0

Semester Two

Code	Course	Credit hours	Contact hours	
			Theory	Practical
US-521	Abdominal Ultrasound	3(3+0)	3	0
US-522	Obstetric Ultrasound	2(2+0)	2	0
US-523	Gynecology Ultrasound	2(2+0)	2	0
US-524	Ultrasound Clinical Practices	4(0+4)	0	12
US-525	Ethics in Medical Imaging	1(1+0)	1	0

Semester Three

Code	Course	Credit hours	Contact hours	
			Theory	Practical
US-631	Doppler Ultrasound	3(3+0)	3	0
US-632	Musculoskeletal Ultrasound	2(2+0)	2	0
US-633	Small Parts Ultrasound	2(2+0)	2	0
US-634	Ultrasound Clinical Practices	5(0+5)	0	10
US-635	Research Methods	2(2+0)	2	0

Semester Four

Code	Course	Credit hours	Contact hours	
			Theory	Practical
US-641	Ultrasound Clinical Practices	5(0+5)	0	10
US- 642	Dissertation	4(0+4)	0	8

Courses contents

US-511 Advanced Medical Education

Health profession education; Adult learning theories; Learning outcomes and skills acquisition; Instructional design (models); Instructional design (micro teaching); Formative Assessment; Communication in multidisciplinary teams; Simulation in multidisciplinary teams; Purposeful assessment; Reflection and feedback; Learning portfolios and Mentorship.

US-512 Applied Anatomy

Cardiovascular system; Lymphatic system; Respiratory system; Digestive system; Urinary system; Peritoneum; Developmental anatomy; Nervous system; General and special senses and autonomic nervous system.

US-513 Applied Physiology

Homeostasis; Body fluid; Cardiac cycle; Cardiac output; Blood; Respiratory; Platelets; Renal physiology; GIT physiology; Endocrine physiology; Male and female genital physiology.

US-514 Applied Pathology

Cell Injury; Apoptosis and necrosis; Adaptation to cell injury; Acute Inflammation; Sequel of acute inflammation; Inflammatory mediators; Intracellular accumulation; Chronic inflammation; Healing and repair; Neoplasia-1; Neoplasia-2; Carcinogenesis; Laboratory diagnosis of cancer • Genetic.

US-515 Ultrasound Physics and Instrumentation

Sound waves; Acoustic variables; Speed of sound; Amplitude; Continuous pulsed wave and duty factor; Wave interference; Attenuation; Sound transmission and echo reflection; Terminology associated with image characteristics; Ultrasound transducers; Sound beams; Pulse echo instruments; Principles of pulse echo imaging; Artifacts; Bio-effects and safety.

US-521 Abdominal Ultrasound

Liver; Gall bladder biliary system; Pancreas; Spleen; Appendix; Aorta; Lymphnodes; Urinary bladder; kidney; prostate.

US-522 Obstetric Ultrasound

Early pregnancy (First, second and third trimester); Gestational age (First: CRL, BPD, EDD, GS, MSD, anomalies, Nuchal translucency, blighted ova, molar pregnancy, trisomy, position of gestational sac, ectopic pregnancy, number of GS, luteal cyst, hematomas, Second trimester (number, BPD, FL, AC, HC, EDD); Placenta position; Grading and anomalies; Liquor measurement and amount (polyhydramnios and oligohydramnios); IUGR; AFI macro and micro size of fetus; Fetal position and weight equation; Third trimester measures (FL, AC, HC, AC, BPD); Fetal weight at birth; Placenta localization and type of previa; EDD; Fetal biophysical profile; Doppler.

US-523 Gynecology Ultrasound

GYN preparation (TVS,TAS); Urinary bladder as window; Uterus shape; Uterus anomaly; Fibroid; Ectopic pregnancy; Uterus anatomy physiology; Endometrium; Pouch of Douglas; Ovaries anatomy, and physiology and pathology; Grading of follicle and cycle; Ovarian cyst and mass; IUCD positioning and type; Cervix; Biophysical uterine; Doppler.

US-524 Ultrasound Clinical Practices

Knobology of ultrasound; Positioning of patients for ultrasound; Patient preparation for Ultrasound; Normal sonographic appearance of organs: abdomen, obstetrics and gynecological; Examination protocols of abdomen, obstetrics and gynecological; Evaluation of abnormalities; Writing diagnostic reports.

US-525 Ethics in Medical Imaging

Introduction to Ethics; Medico-legal issues in radiology; Principles of ethics; ARRT standard of ethics; Confidentiality; Informed consent and negligence.

US-631 Doppler Ultrasound

Physics of Doppler; Color Doppler; Power Doppler; Blood flow indices measurement; Signal; Carotid; Abdomen; Venous and artery normal and abnormal; DVT; Pathology vacuolar; Vacuolar anatomy and pathology; Renal doppler; Upper and lower venous and artery; Vistula; Sub-clavian shunt; AV Vistula,principle of Echocardiography ,basic views and technique of echocardiography.

US-632 Musculoskeletal Ultrasound

Musculoskeletal anatomy; Physiology and pathology; Shoulder; Elbow; wrist; Knee; Ankle and Foot; Pediatric hip joint; Nerves and muscle scan normal and abnormalities.

US-633 Small Parts Ultrasound

Breast; Scrotum; Thyroid; Parathyroid; Penis; Eye; Brain of infant and neonate; Doppler.

US-634 Ultrasound Clinical Practices

Knobology of Doppler ultrasound; Positioning patients for ultrasound; Patient preparation for ultrasound; Normal sonographic appearance of organs: vascular, small parts and musculoskeletal; Examination protocols of vascular, small parts and musculoskeletal; Evaluation of abnormalities; Writing diagnostic reports.

US-635 Research Methods

Layout of thesis; definition and importance of research; Characteristics of research; Classification of health research; Identify a research topic: Introduction (problem of the study, objective, significance and overview), Literature review (theoretical background and previous studies); Materials and methods (materials, design, population, sample, method of data collection and analysis, ethical approval); Research proposal, Results, discussion and conclusion;

References citation and bibliography; Central tendency and dispersion; Association; Tests of significance; Statistical decision theory.

US-641 Ultrasound Clinical Practices:

Advanced Doppler and clinical applications of Ultrasound in medicine.

RAD-642 Dissertation

Scientific writing of dissertations: Preliminaries; Introduction; Literature Review; Materials and Methods; Results; Discussion; References; Appendices.

Award of the degree

The Scientific Council of the National University, based on the recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

M.Sc. Diagnostic Medical Ultrasound

National University Research Institute

(NURI)

Vision

NURI be an ever leading excelling centre of excellence in researches related to neglected tropical diseases and antimicrobial drug resistance



Mission

Securing healthy communities through identifying the risk factors related to increasing prevalence of neglected tropical diseases and communicating research outcomes to get rid of predisposing factors enhancing their onset

Resources and Finance

NURI is financed by:

- National University: 500000 SDG
- German Research Foundation: 75000 €
- Alexander von Humboldt Foundation: 20000 €

Quality Assurance

NURI is accredited by the:

- European Network of Quality Assurance (ENGA)
- British Accreditation Council (BAC)

Research Activities

Ongoing Research Projects:

- Epidemiological and bimolecular survey of cystic echinococcosis in Sub-Saharan Africa
- *Echinococcus granulosus sensu stricto*: A silent emerging hazard to human population in Sudan
- Molecular Characterization and phylogenetic analysis of *Theileria* and *Babesia* species in Sinnar state, Sudan
- Whole genome sequencing of Methicillin-resistant *Staphylococcus aureus* isolated from Sudan.
- Prevalence and distribution of II-17AG197A (rs2275913) and II-17FA7488G (rs763780) polymorphism among Sudanese population
- Parasite and host factor associated with Post Kalazar Dermal Leishmaniasis (PKDL)
- Genetic susceptibility of rheumatoid arthritis in Sudanese patients: possible candidate genes.
- Genetics and Microbiotics of susceptibility to Irritable bowel syndrome (IBS) in Sudanese patients.
- Immunogenetics of Major depression disorder among Sudanese patients.

Projects under preparation

- Sequencing of Bacterial Genomes: Principles and insights into pathogenesis and development of antibiotic resistance
- Whole genome sequencing of *Theileria* and *Babesia* spp. isolated from the Sudan
- Parasite and host factors associated with the progress of post kala-Azar dermal Leishmaniasis

Graduate programs and training activities

(1) Master of Bioinformatics (Submitted to the Ministry of Higher Education and Scientific Research for final approval)

(2) Training programs in:

- Basic and Advanced Molecular Biology
- Basic and Advanced Bioinformatics
- Research Methodology
- Scientific Writing
- Data Entry and Analysis
- R-Statistics
- Immunology

Facilities: Four well equipped laboratories:

Molecular Biology Lab,
Immunology Lab,
Bioinformatics lab
Tissue Culture

International Partners and Collaborators

- University of Hohenheim, Germany
- University of Leipzig, Germany
- Alexander von Humboldt Foundation, Germany
- German Research Foundation, Germany
- International Mevlana Foundation, Turkey
- University Putra Malaysia (UPM)
- University Sains Malaysia (USM)

Publications

(2016-2017)

- 1) Khalda Abbass Elkhazeen, Rihab Ali Yaji, Diyaa Eldeen Ahmed Salih, Rihab Ali Omer and Atif Elamin Abdelgadir (2017). Prevalence and Risk Factors Associated with Bovine Trypanosomosis Using Conventional Methods and Polymerase Chain Reaction (PCR) in the Blue Nile State, *Sudan. Journal of Applied Science and Research*, 5 (2):12-23.
- 2) Mohammed Sirelkhatim, Ghada Sulieman Sharaf Eldin, Imad Fadl Almula, Ahmed Babiker, Rihab Ali Omer (2016). Tuberculosis in Sudan: Efficiency of Diagnostic Techniques Commonly Used and Investigation of some Socio-demographic Factors which may Influence the Disease Prevalence. *Sudan Medical Monitor*. 11(3): 71-77
- 3) Sofia B. Mohamed, Mohamed S. Ali, Faisal M. Alamir, Tahani B. Alyas, Abdallah E. Ahmed, Almeen O. Seed, Rihab A. Omer (2017). First Complete Genome Sequence of

- Methicillin-resistant *Staphylococcus aureus* strain SO-1977 Isolated from Khartoum-Sudan. *Genome Announc*: 5(42): e00945-17. doi: 10.1128/genomeA.00945-17
- 4) Nahla E. Abdelraheem, Ghada M. El-Tayeb, Lamia O. Osman, Samar A. Abedlrhman, Aisha S. Ali, Ahmed H. Elsadig, Sofia B. Mohamed (2016). A Comprehensive in Silico Analysis of the Functional and Structural Impact of Non-Synonymous Single Nucleotide Polymorphisms in the Human KRAS Gene. *American Journal of Bioinformatics Research*, 6(2): 32-55 DOI: 10.5923/j.bioinformatics.20160602.02
 - 5) Nuha A. Mahmoud., Elham I. Mohammed., Siham O. Elshafei, Ahmed H. Elsadig, Rihab A.Omer., Sofia B. Mohamed (2017) Bioinformatics Analysis of Single Nucleotide Polymorphism in Multiple Drug Resistance Protein 1(ABCB1) and Multi-Drug Resistance-Associated Protein 1(ABCC1) in Bos Taurus. *American Journal of Bioinformatics Research*. DOI: 10.5923/j. bioinformatics.
 - 6) Elham I. M. Ibrahim, Rihab Ali Omer, Ahmed H. Elsadig, Mohamed Sir Elkhatim, Sofia B. Mohamed (2017). In Silico Analysis of the Structural and Biochemical Features of the Granulocyte-Macrophage Colony Stimulating Factor (GM-CSF), Interleukin-3 (IL-3) and Interleukin-5 (IL-5) Receptors Subunit α . *American Journal of Bioinformatics Research*., 7(1): 25-47.DOI: 10.5923/j.bioinformatics.20170701.03.
 - 7) Dalia. A. Mohamed , Mohamed A. abdalla, Abdallah E. Ahmed, Mohamed M. Hassan, Abbas M. Ahmed, Mona O. Elhaj (2017). Molecular characterization and Phylogenetic Analysis of *Clostridium botulinum Mosaic* Type D/C Isolated from Sudan. *American Journal of Microbiological Research*: 5(3), 59-65. DOI: 10.12691/ajmr-5-3-2.

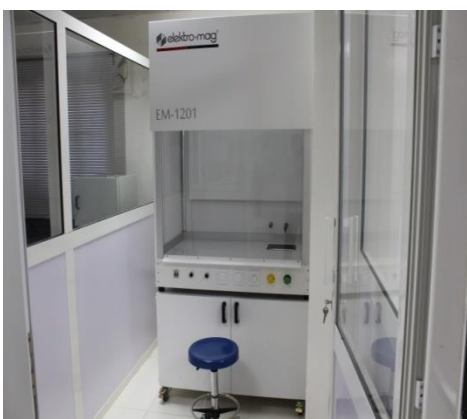
Manuscripts Submitted for Publication

- 1) Rihab Ali Omer, Arwid Dauschies; Sandra Gawlowska; Ayman Elnahas; Mohamed B Saad; Peter Kern; Sofia Bashir; Mohammed Sir Alkhatim; Amin Osman; Suzan Alhakeem, Sofia Basheer, Abdalla Elsir, Faisal Alamir, Ayman Elnahas, Peter Kern and Thoamg Romig (2017). First Detection and Phylogenetic Identification of *Echinococcus sensu stricto* in Stray Dogs in Central Sudan.
- 2) Teivi Laurimäe, Liina Kinkar, Epp Moks, Thomas Romig, Rihab A. Omer, Adriano Casulli, Gérald Umhang, Vanessa Andresiuk, Guna Bagrade, Malik Irshadullah, Mitra Sharbatkhori, Hossein Mirhendi, Francisco Ponce-Gordo, Silvia V. Soriano, Antonio Varcasia, Antti Lavikainen, Mohammad Rostami Nejad and Urmas Saarma (2017). A Reappraisal of the Taxonomy of *Echinococcus*: New Evidence from Nuclear Genes suggests those *Echinococcus granulosus sensu lato* genotypes G6/G7 and G8/G10 Can be regarded as two Separate Species.
- 3) Mohamed S. Ali, Nurulfiza M. Isa, Faisal M. Abdelrhman, Tahani B. Alyas, Sara E. Mohammed, Abdallah E. Ahmed, Zainab SA. Ahmed, Nyok-Sean Lau, Mohamed I. Garbi, Abdullah Al-Ashraf Amirul, Almeen O. Seed, Rihab A. Omer, Sofia B. Mohamed.(). Whole Genome Sequence and Comparative Genomic Analysis of Multidrug-Resistant *Staphylococcus aureus* Strain SO-1977.
- 4) Sofia B. Mohamed, Atif Alagib, Mohamed M. Hassan, Wendell C. Johnson, Hala E. Hussein and Massaro W. Ueti (2017). Molecular Characterization and Phylogenetic Analysis of *Theileria* and *Babesia* Species in Sennar State, Sudan.
- 5) Zainab SA. Ahmed, Mohammed S. Ali, Nadia A. Elshiekh, Sami Adam Ibrahim, Ghada M. El-Tayeb, Ahmed H. Elsadig, Rihab A. Omer, Sofia B. Mohamed. In Silico Analysis of Deleterious nsSNPs (missense) of Dihydrolipoamide Branched-chain Transacylase E2 Gene Associated with Maple Syrup Urine Disease type II.

Manuscripts under Preparation

- 1) Rihab Ali Omer, Suzan Alhakeem, Mohamed Sir Alkhatim, Amin Osman, Sofia Bashir, Abdalla Elsir, Faisal Alamir, Thoamg Romig and Peter Kern (2017). Bioinformatics Approaches for Structural and Functional Analysis of Cytochrome Oxidase Subunit-1 Isolated from *Echinococcus sensu stricto* in Sudan. .
- 2) Rihab Ali Omer, Suzan Alhakeem, Mohamed Sir Alkhatim, Amin Osman, Sofia Bashir, Abdalla Elsir, Faisal Alamir, Thoamg Romig and Peter Kern (2017). First Detection of *Echinococcus sensu stricto* Among Sudanese Population.
- 3) Mohammed B.Mohammed, Mohamed S. Ali, Abdallah E. Ahmed, Nusiba I. Abdalla, Almeen O. Seed, Rihab A. Omer, Sofia B. Mohamed (2017). In silico Analysis of Penicillin- binding Protein 5 as an Inhibitory Target of Beta-lactam Antibiotics in *Staphylococcus aureus* Strain SO-1977.

- 4) Talal A. Awad, Mohammed B.Mohammed, Mohamed S. Ali, Abdallah E. Ahmed, Nusiba I.Abdalla,Almeen O. Seed, Rihab A. Omer, Sofia B. Mohamed (2017). Prediction of Natural TetR ligands by a Docking Approach in *Staphylococcus aureus* Strain SO-1977.
- 5) Nusiba I.Abdalla, Mohamed S. Ali, Mohammed B.Mohammed, Abdallah E. Ahmed, Nusiba I.Abdalla,Almeen O. Seed, Rihab A. Omer, Sofia B. Mohamed (2017). In-silico Structure Prediction of TcaR Protein in in *Staphylococcus aureus* Strain SO-1977.



National University Research Institute

(NURI)



M.Sc. Bioinformatics
(Awaiting MHESR final approval)

Introduction

Bio-Informatics is where computer science and biology join to address and solve basic problems associated with human health, environment and agriculture. Recent developments in the sciences have produced a wealth of experimental data of sequences and three-dimensional structures of biological macromolecules. With the advances of computer and information science, a variety of databases are made available to the public on the Internet. This master program provides knowledge of Bioinformatics for interpretation of the rapidly expanding biological information. It will empower the students with Bioinformatics tools for reviewing the major scientific databases needed to cater for research problems in biology.

General objectives

Provide:

- Apt bioinformatics knowledge for interpretation of the rapidly expanding biological information.
- Basic concepts of bioinformatics to identify, seek, establish, maintain and exchange research information in biology.

Specific objectives

Equip the students with:

- Requisite background in modern biology, biochemistry, cell biology, genetics and molecular biology.
- Familiarity in computational methods to address problems in molecular biology.
- Knowledge on storage, retrieval, sharing and use of biological information in core areas of Bioinformatics: multiple sequence alignment, phylogenetic trees, genomics, proteomics etc...
- Skills in applied Bioinformatics: immunoinformatics, Drug designing and discovery.

Learning outcomes

Upon successful completion of the program, the successful candidates should be able to:

- Identify strategies and apply appropriate tools in Bioinformatics.
- identify topical problems drawn from ongoing research and their applications
- Interpret data related to sequences of nucleotides and amino acids, protein domains, and protein structures.

- Develop and implement efficient tools to access and manage data.

Admission requirements

- Applicants must satisfy the general regulations set by the faculty of graduate studies and scientific research of the National University-Sudan for registration for master degrees.
- Eligible candidates are holders of B.Sc. Honors from a recognized University in: Sciences, Agriculture, Medicine, Veterinary Sciences, Pharmacy and Computer Sciences.

Study program

Semester One

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
BIO-611	Basic Molecular Biology	3(2+1)	2	2
BIO-612	Introduction to Proteomics	3(3+0)	3	0
BIO-613	Object Oriented Programing	3(2+1)	2	2
BIO-614	Database Management System	2(1+1)	1	2
BIO-615	Fundamentals of Algorithm	2(1+1)	1	2

Semester Two

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
BIO-621	Fundamental of Bioinformatics	3(1+2)	1	4
BIO-622	Structural Biology	4(2+2)	2	4
BIO-623	Alignment and Sequence Analysis	3(2+1)	2	2
BIO-624	Data Mining and Machine Learning	4(2+2)	2	4
BIO-625	Biostatistics	3(2+1)	2	2

Semester Three

Code	Course	Credit hours	Contact hours/week	
			Theory	Practical
BIO-631	Immunoinformatics	4(2+2)	2	4
BIO-632	Molecular Modeling and Drug Design	4(2+2)	2	4
BIO-633	Research Methodology	3(3+0)	3	0
BIO-634	Research paper	4(0+8)	0	8

Courses contents

BIO-611: Basic Molecular Biology

Genome organization; DNA structure; Replication; Repair and recombination; Prokaryotic and eukaryotic transcription; Post transcriptional modifications; Translation and transport; Mutations; Oncogenes and tumor suppressor genes; DNA extraction methods; RNA extraction; Polymerase chain reaction; Real time PCR; RFLP; Gel electrophoresis; DNA sequencing.

BIO-612: Introduction to Proteomics

Protein biology; Advanced proteomics: Protein Structure and function; Protein analysis for cellular function; Protein folding and unfolding; Protein-protein interaction.

BIO-613: Object Oriented Programing

Java Basics; Multithreading and communication AWT and Event Handling; BioJava; Introduction to scripting with python; Writing python scripting; Making plot with matplotlib; Scientific computing with python; searching and sorting; data clustering and classification.

BIO-614: Database Management System

Introduction; Data models; Structured query language; Relational database and storage; Concurrency control techniques; Information retrieval.

BIO-615: Fundamentals of Algorithm

Computing algorithms: sorting, searching and strings Matching; Graphs; Trees; Algorithm design and analysis

BIO-621: Fundamental of Bioinformatics

Introduction to Bioinformatics; Bioinformatics resources; Open access bibliographic resources and literature databases; Databases; Bioinformatics software and tools; Sequence file formats; Protein and nucleic acid sequence; Submitting DNA sequence to the Database; Taxonomy and phylogeny; Sequence patterns and profiles.

BIO-622: Structural Biology

Prediction of genes; Primer design; Proteomics; X-ray crystallography; Predicting protein structure and function from sequence; Structure prediction strategies; Secondary structure; prediction; Protein modeling; Classification and comparison of protein 3D structures; Protein/protein Interaction; Basic concepts of identification of disease genes (SNP).

BIO-623: Alignment and Sequences Analysis

Sequence analysis; Scoring matrices; Pair wise sequence alignments; Multiple sequence alignments (MSA); Comparative genomics; Sequence patterns and profiles; Algorithms for derivation and searching sequence patterns; Taxonomy and phylogeny.

BIO-624: Data Mining and Machine Learning

Introduction; Primitives and system architectures; Concept description and association rules; Classification and prediction.

BIO-625: Biostatistics

Introduction to biostatistics: significance and basic concepts; Descriptive statistics: measures of central tendency and dispersion; Probability theory: definitions, probability types, probability rules and random variables; Life table; Distribution theory: the normal distribution, standard normal distribution and t-distribution; Sampling distribution and central limit theorem; Estimation; Hypothesis testing.

BIO-631: Immunoinformatics

Introduction to immunology; Antigens and antibodies; Major histocompatibility Complex; Disorders of human immune system; Introduction to immunoinformatics and Immunological database; Computational vaccinology.

BIO-632: Molecular Modeling and Drug Design

Atomic and molecular structure; Chemical bonds; Symmetry and Principles; Introduction to organic chemistry; Stereochemistry; Heteroaromatics; Molecular modeling and drug design; Introduction to drug design and development; Drug targets; Lead identification and modification; Computer-aided drug design; Drug delivery; Pre-clinical and Clinical Testing.

BIO-633: Research Methodology

Foundations of research methodology; Introduction to quantitative and qualitative research; Mixed Methods Research

BIO-634: Research Paper

Research skills in bioinformatics: design of experiments, data collection and analysis, scientific writing; Oral presentations; Guided research on specific topics in bioinformatics.

Human resources and facilities

Teaching staff: One professor

Three associate professors

Three assistant professors

Two lecturers

Facilities: Five lecture rooms: 70 seats each

Eight seminar rooms: 50 seats each

Computer laboratory: 250 seats

National University main library: 400 seats

E. Library: 250 seats

Duration of the program: Three semesters 16 weeks each.

Teaching modules

Lectures, tutorials, presentations, seminars, assignments and practical sessions

Teaching language: English

Examinations regulations

- Abide by the examinations rules of the general regulations of the graduate studies of the National University-Sudan
- A student failing any supplementary examination should repeat the course.
- A student scoring less than 60% in the theoretical and / or the practical component of a specialization subject should sit for a supplementary examination.
- Each student shall conduct a supervised piece of research and submit a paper.
- All students shall sit for oral examination at the end of semester three.

Assessment: Continuous assessment 30%

Final examination 70%

Grading system: A⁺ (≥ 85) A (80 – 84) B⁺ (70 – 79) B (65 – 69) C (60-64) F (<60)

Award of the degree

The Scientific Council of the National University, based on the recommendation of the board of the Faculty of Graduate Studies and Scientific Research, shall award the successful candidate

M.Sc. Bioinformatics