

Estd. 1962

With CGPA 3.52

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SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४ ०२३१—२६०९४८७



SU/BOS/Science/09

Date: 02/01/2024

To,

The Principal,	The Head/Co-ordinator/Director
All Concerned Affiliated Colleges/Institutions	All Concerned Department (Science)
Shivaji University, Kolhapur	Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

	M.Sc.Part-II (Sem. III & IV) as per NEP-2020 (1.0)							
1.	Computer Science	7.	Biochemistry (HM)					
2.	Data Science	8.	Biotechnology (HM)					
3.	Information Technology (Entire)	9.	Biotechnology					
4.	M.C.A.	10.	Medical Information Management					
5.	Food Science & Nutrition	11.	Environmental Science					
6	Food Science & Technology	12.						

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website <u>www.unishivaji.ac.in NEP-2020 (Online Syllabus)</u>

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Dy Registrar Dr. S. M. Kubal

Copy to: The Dean, Faculty of Science & Technology 8 P.G. Admission/Seminar Section 1 2 Director, Board of Examinations and Evaluation 9 Computer Centre/ Eligibility Section 3 The Chairman, Respective Board of Studies 10 Affiliation Section (U.G.) (P.G.) 4 B.Sc. Exam/ Appointment Section 11 Centre for Distance Education

SHIVAJI UNIVERSITY, KOLHAPUR



Established: 1962

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Structure and Syllabus in Accordance with

National Education Policy - 2020

with Multiple Entry and Multiple Exit

Master of Science (Information Technology) Part II

> under Faculty of Science and Technology

(To Be Implemented From Academic Year 2024-25)

Structure in Accordance with National Education Policy - 2020 With Multiple Entry and Multiple Exit Options M.Sc. (Information Technology) Part – II (Level-6.5)

	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectur	Hours	Credit	Maximum	Minimum	Exam.	Maximum	Minim	Exam.
		es +	(Per		Marks	Marks	Hours	Marks	um	Hours
		Tutori	week)						Marks	
		al								
		(Per								
		week)								
					Semester-III					
	MMT-301	4		4	80	32	3	20	8	1
Maior	MMT-302	4		4	80	32	3	20	8	1
Mandatory	MMPR 303		6	4	80	32	3	20	8	1
i i i i i i i i i i i i i i i i i i i	MMT-304	2		2	40	16	2	10	4	1
Major	MET-305	4		4	80	32	3	20	8	1
Elective	MET-306	4		4	80	32	3	20	8	1
Research	RP-307	4		4	80	32	3	20	8	1
Project										
To	tal			22	440			110		
					Semester-IV					
Major	MMT-401	4		4	80	32	3	20	8	1
Major Mandatory	MMT -402	4		4	80	32	3	20	8	1
	MMPR -403		6	4	80	32	3	20	8	1
Major	MET-404	2		2	40	32	2	10	8	1
Elective	MET-405	2		2	40	32	2	10	8	1

Research	RP-406	4	8	100	32	3	100	0	1
Project									
Tot	al		10	380			170		
Total (Sem III + Sem IV)			40	800			200		
Total				1680			420		

MMT–MajorMandatory Theory	• Total Marks for M.ScI :1100					
MMPR–MajorMandatoryPractical	• Total Credits for M.ScII : 1100 (Semester III & IV) : 44					
MET–MajorElective Theory	• Separate passing is mandatory for University and Internal					
MEPR–MajorElective Practical	Examinations					
• FP- Field Project						
# Evaluation scheme for Research Project shall be decided by concerned	d BOS					
## Evaluation scheme for Research Project shall be decided by concern	ed BOS					
Requirement for Exit after Level 6.5:						
Students can exit after completion of Level 6.5 with Master of Information Technology						

Course Codes:-

	M.Sc. Information Technology Part-II	Semester-III					
Course Code	urse Code Major Mandatory						
MMT-301	Artificial Intelligence (4 credit)	MSU0325MML923I1					
MMT-302	Image Processing (4 credit)	MSU0325MML923I2					
MMPR 303	Practical-III (4 credit)	MSU0325MMP923I1					
MMT -304	Web Development (2 credit)	MSU0325MML923I3					
RP-307	Research Project (4 credit)	MSU0325FPP923I					
	Major Elective						
MET-305	1) R Programming (4 credit)	MSU0325MEL923I1					
MET-306	2) Cyber Security (4 credit)	MSU0325MEL923I2					
	M.Sc. Information Technology Part-II	Semester-IV					
	Major Mandate	ory					
MMT-401	Android Programming (4 credit)	MSU0325MML923J1					
MMT -402	Advance Python Programming (4 credit)	MSU0325MML923J2					
MMPR -403	Practical-IV (4 credit)	MSU0325MMP923J1					
RP-406	Research Project (8 credit)	MSU0325FFP923J					
	Major Elective						
MET-404	1) Deep Learning (4 credit)	MSU0325MEL923J1					
MET-405	2) Agile Project Management (4 credit)	MSU0325MEL923J2					

Syllabus: -

M. Sc. Information Technology (Part II) (Level-6.5) (Semester III) (NEP-2020) (Introduced from Academic Year 2024-25)

Title of Course: Artificial Intelligence Course Code: MMT-301 Total Credits: 04

Course Outcomes:

1. Students will be able to develop applications of AI.

2. Students will be able to understand Problem Solving Approach to Typical AI problems.

<u>UNIT I</u>

Introduction-Definition - Future of Artificial Intelligence - Characteristics of

Intelligent Agents-Typical Intelligent Agents - Problem Solving Approach to Typical AI problems.

UNIT II

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics –Local Search Algorithms and Optimization Problems -Searching with Partial

Observations - Constraint Satisfaction Problems - Constraint Propagation -

Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

<u>UNIT III</u>

Knowledge Representation First Order Predicate Logic – Prolog Programming –Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge

Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information

<u>UNIT IV</u>

Software Agents Architecture for Intelligent Agents - Agent communication -

Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

(15)

(15)

(15)

(15)

<u>UNIT V</u>

Applications AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware –Perception – Planning – Moving

Text Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.

2. Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.

3. I. Bratko, -Prolog: Programming for Artificial Intelligence, Fourth Edition,

Addison-Wesley Educational Publishers Inc., 2011.

Title of Course: Image Processing Course Code: MMT -302 Total Credits: 04

Course Outcomes:

- 1) Review the fundamental concepts of a digital image processing system.
- 2) Analyze images in the frequency domain using various transforms.
- 3) Evaluate the techniques for image enhancement and image restoration.

<u>UNIT I</u>

Introduction: Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used in Digital Image Processing, Intensity Transformations and Spatial Filtering: Basics, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering.

<u>UNIT II</u>

Filtering in the Frequency Domain: Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-----Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections

<u>UNIT III</u>

<u>Wavelet and Other Image Transforms:</u> Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, BasisImages, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression. Image Compression and Watermarking: Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking

(15 Hours)

(15 Hours)

(15 Hours)

UNIT IV

<u>Morphological Image Processing:</u> Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Morphological Algorithms, Morphological Reconstruction, Morphological Operations on Binary Images, Grayscale Morphology Image Segmentation I: Edge Detection, Thresholding, and Region Detection: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Superpixels, Region Segmentation Using Graph Cuts.

Reference Books:

- 1. Digital Image Processing and Computer Vision, Sonka, Hlavac, Boyle-Cengage learning.
- 2. Digital Image Processing, William Pratt- John Wiley.
- 3. The Image Processing HndBook J.C. Russ CRC fifth edition 2010

Title of Course: Practical-III

Course Code: MMPR -303 Total Credits: 04

Course Outcomes:

- 1) To become familiar with programming environment.
- 2) To implement advanced data structures
- 3) To be familiar with different types of databases.

Lab work is based on Artificial Intelligence and Image Processing. This laboratory course should consist of 10 to 12 programming exercises with focus on covering the hands-on aspects covered in theory course.

Title of Course: Web Development Course Code: MMT -304

Total Credits: 02

Course Outcomes:

After completion of this course, students will able to,

Understand basics of website and web development life cycle.

2. Design website using HTML and CSS

3. Implement client-side scripting for website development

<u>UNIT I</u>

HTML and CSS:- Introduction to HTML, History, Features HTML tags & attributes, HTML Form elements, HTML Frameset, Limitations of HTML, Basics of CSS, Syntax, Types of CSS, Importance of CSS, CSS Selectors-Group, id, class, CSS properties- Border, background, list, image, margins, Advantages and limitations of CSS

<u>UNIT II</u>

JAVA Script: - Introduction to JavaScript., Difference between client side and server-side scripting., Identifier & operators, Control structure, Dialog boxes, Functions, Event Handling, Objects, Form Validation

Reference Books:

- 1. Complete HTML-Thomas Powell
- 2. HTML and JavaScript-Ivan Bayross
- 3. Javascript: The Complete Reference by ThomasPowell, FritzSchneider

(15 Hours)

(15 Hours)

2) Expand R by installing R packages.

3) Explore and understand how to use the R documentation.

1) Master the use of the R and RStudio interactive environment.

4) Read Structured Data into R from various sources.

<u>UNIT I</u>

Course Outcomes:

Introduction to R:- Installation of R &RStudio, Features of R, Variables, Constants, Operators in R, Datatypes and R Objects, Accepting Input, Important Built-in functions, Creating Vectors, Accessing elements of a Vector, Operations on Vectors, Vector Arithmetic.

<u>UNIT II</u>

<u>R Data Types:</u> Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R - Variables: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables - R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators - R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.

<u>UNIT III</u> Hours)

<u>Control statements and functions:</u> - Control statements: if...else, if else() function, switch() function, repeat loop, while loop, for loop, break statement, next statement, Formal and Actual arguments, Named arguments, Global and local variables, Argument and lazy evaluation of functions, Recursive functions. Creating strings, paste(), Formatting numbers and string using format(), String manipulation

UNIT IV

<u>Matrices, Arrays and Data frames:</u> Creating matrices, Accessing elements of a Matrix, Operations on Matrices, Matrix transpose, Creating arrays, Accessing array elements, Calculations across array elements, Introduction to data frames and basic operations on data frames.

(15 Hours)

(15Hours)

(15 Hours)

(15

Title of Course: R Programming

Total Credits: 04

Course Code: MET-305

UNIT V

Introduction to Data Visualization:- Data visualization basics, Installing and loading packages, importing data, Working with missing data, Extracting a subset of a data frame, Scatter Plot, Box Plot, Bar plot, Plotting categorical data, Stacked bar plot, Histogram, plot() function and line plot, pie chart / 3D pie chart.

Reference Books:

R Programming for Data Science	Peng, R.D.	Bookdown: New York	2020
An Introduction to Statistical Learning	Gareth James	Springer	2017

Title of Course: Cyber Security

Course Code: MET-306

Total Credits: 04

Course Outcomes:

After Completion of this course, students will be able to;

1. Understand importance of cyber security and security management.

- 2. Learn different security threats.
- 3. Understand cyber security laws and importance of security audit.
- 4. Learn concept of wireless network security.

<u>UNIT I</u>

UNIT II

Introduction to Cyber Security Cyber Security: Definition, Importance, Computer ethics, Cyber Security Policy, Data Security, Mobile Device Security, User Security, File Security, Password Security, Browser Security, Email Security, Phishing Encryption, Decryption, Digital Signature, Firewall, Configuring, Windows Firewall.

Types of Security and Security Management Types of Security: Background and Current Scenario, Types of Attacks, DoS attack, Goals for Security, E-commerce Security, dimensions of E-commerce security, Security protocols, Computer Forensics, Steganography, Security Management- Overview of Security Management, Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices.

Security Threats and Access Controls Security Threats: Definition, Types of Threats - Virus, Worms, Trojan Horse, Malware, Ransomware, Identity theft etc, Torrent and infected websites, Antivirus-Definition, Types, features, advantages, limitations. Access Controls: Overview of Authentication and Authorization, Overview of Intrusion Detection Systems, Intrusion Detection Systems and Intrusion Prevention System.

<u>UNIT IV</u>

UNIT III

Wireless Network Security Wireless Network Security- Components of wireless networks, Security issues in wireless, Wi-Fi Security, Risk of Using Unsecured Wi-Fi, Bluetooth and its security, Firewall, types of firewalls.

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

Reference Books:

1. Computer Network - A S Tannenbaum

2. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyber war, Hacking) - Harry Colvin.

3. How NOT To Use Your Smartphone - Rodney D Cambridge.

4. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book -A.M. Perry.

Title of Course: Research Project

Course Code: RP-307

Total Credits: 04

Course Outcomes:

• The student is required to engage industrial research project during the semester.

M. Sc. Information Technology (Part II) (Level-6.5) (Semester IV) (NEP-2020) (Introduced from Academic Year 2024-25)

Title of Course: Android Programming

Course Code: MMT-401

Total Credits: 04

Course Outcomes:

- 1) Understand the building blocks of Mobile Operating Systems
- 2) Analyze different elements of Android Development Environment
- 3) Illustrate the structure of Mobile Applications using Android
- 4) Identify different components used in Mobile Applications using Android

Introduction to Mobile Operating System Mobile operating system, Operating system structure, Constraints and Restrictions, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features. Brief history of Android, Different types of mobile applications

Android Development Environment Introduction to Mobile development IDE's, Setting up development environment, Android Software Development, Working with the AndroidManifest.xml, Dalvik Virtual Machine & .apk file extension, Android Architecture, Building a sample Android application using Android Studio. Android Project Structure, Working with emulator.

Android Application Framework Layouts &Drawable Resources, Basic Building blocks - Activities and Activity lifecycle, UI Components - Views & Notifications, Components for communication -Intents & type of Intents, Android API levels (versions & version names), Developing sample Application

Basic UI design Form widgets, Text Fields, Layouts, Option menu, Context menu, Sub menu, Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup, Introduction to SQLite Programming.

Reference Books:

1. AnubhavPradhan, Anil V Deshpande, "Mobile Apps Development" Edition:I

2. Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS

UNIT III

UNIT II

UNIT I

UNIT IV

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

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Title of Course: Advance Python Programming

Course Code: MMT-402

Total Credits: 04

Course Outcomes:

- 1) The programming skills in advanced Python.
- 2) The Object-oriented programming skills in Python.
- 3) The skill of to design graphical-user interfaces (GUI) in Python.

UNIT I

Object Oriented Python :-

Topics Assertion ,Decorators, Generators, Iterators. Creation, Execution of threads using threading module

UNIT II

Database programming using Python:-

Connecting to a database (sqlite) using Python, Sending DML and DDL queries and processing the result from a Python Program.

UNIT III

<u>GUI in Python:-</u>

Introduction to GUI building libraries, Widgets, Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, Text, Toplevel, Spinbox, PanedWindow, LabelFrame

<u>UNIT IV</u>

Basic image processing using Python

Introduction to digital image processing, Basic operations on an imge, Crop, Scale, Rotate, Flip, Changing contrast, brightness and color, Edge detection, blur, sharpening.

Basic data visualization unsing:- Introduction to Matplotlib, Scatter plot, Line plot, Bar chart, Histogram Box plot.

Reference Books:

- 1. Martin C. Brown (Author), "Python: The Complete Reference" McGraw Hill Education, Fourth edition, 2018
- 2. Michael H Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.
- 3. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python, BPB publication, 1st Edition, 2019.

(15Hours)

(15Hours)

(15 Hours)

Title of Course: Practical-IV

Course Code: MMPR-403

Total Credits: 04

Course Outcomes:

- 1. To become acquainted with programming environment.
- Students will be able to use advanced technology in Python Programming
- 3. Students will learn how to work with Android Programming.

Lab work is based on Android Programming and Advanced Python Programming. This laboratory course should consist of 10 to 12 programming exercises with focus on covering the handsonaspectscovered intheory course.

Title of Course: Deep Learning

Course Code: MET-404

Total Credits: 04

Course Outcomes:

1) To present the mathematical, statistical and computational challenges of building neural networks

(15 Hours)

(15 Hours)

(15 Hours)

2) To study the concepts of deep learning

UNIT I

Applied Math and Machine Learning Basics: Linear Algebra: Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence and Span, norms, special matrices and vectors, eigen decompositions. Numerical Computation: Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization (15 Hours)

<u>UNIT II</u>

UNIT IV

Deep Networks: Deep feedforward network, regularization for deep learning, Optimization for Training deep models

<u>UNII</u>	<u>III </u>			
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Convolutional Networks, Sequence Modelling, Applications

Deep Learning Research: Linear Factor Models, Autoencoders, representation learning

Reference Books:

1. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courvile An MIT Press book 1st 2016

2. Fundamentals of Deep Learning Nikhil Buduma O'Reilly 1st 2017

Title of Course: Agile Project Management

Course Code: MET-405 Total Credits: 04

Course Outcomes:

- 1) To understand the state-of-the-art in network protocols, architectures and applications.
- 2) Analyze existing network protocols and networks.
- 3) Develop new protocols in networking
- 4) To understand how networking research is done
- 5) To investigate novel ideas in the area of Networking via term-long research projects.

<u>UNIT I</u>

Business strategy and project selection, The Basics of Project and Project Management (PM) – i.e. "PM for Dummies", The nature of project management, How projects differ from line work Project, management definitions Project management in a systems context Project, typologies Project life cycle / Stages within a project

<u>UNIT II</u>

The Basics of the Agile Project management, Modernizing Project Management: Introducing Agile Project Management, The Agile Manifesto and Principles, Changes as a Result of Agile, Changing Team Philosophy: Working in Agile

<u>UNIT III</u>

Project design - Complexity - Activities and Outputs - Projects, Programs and Portfolios

<u>UNIT IV</u>

The communication in project, Managing Team Dynamics and Communication, Choosing the Right Project Team Members, Risks, The project organization / The influence of the management structure, Project execution

Reference Books:

- 1) Griffiths, M. (2012). PMI-ACP Exam Prep. United States: RMC.
- 2) Admad, G., Soomro, T.R., and Brohi, M.N. (2014). Agile methodologies: Comparative study and future direction.

(15Hours)

(15 Hours)

(15Hours)

(15Hours)

Title of Course: Research Project

Course Code: RP-406

Total Credits: 08

Course Outcomes:

- Carry out a substantial research-based project
- Demonstrate capacity to improve student achievement, engagement and retention
- Demonstrate capacity to lead and manage change through collaboration with others
- Demonstrate an understanding of the ethical issues associated with practitioner research
- Use research findings to advance education theory and practice.