MAR IVANIOS COLLEGE
(AUTONOMOUS)

Affiliated to the University of Kerala
Thiruvananthapuram
Kerala

SCHEME AND SYLLABUS FOR THE

FOUR YEAR UNDERGRADUATE PROGRAMME (FYUGP)

MAJOR DISCIPLINE
COMPUTER SCIENCE

(*With effect from 2024 Admissions*)

Approved by the Board of Studies in
Computer Science

CONTENTS

PREAMBLE

National Education Policy (NEP 2020) envisions 'higher education as playing an extremely important role in promoting human as well as societal wellbeing and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all' (Section 9.1). NEP also expects higher education 'to develop good, thoughtful, well-rounded, and creative individuals, enabling an individual to study one or more specialized areas of interest at a deep level, and also develop character, ethical and Constitutional values, intellectual curiosity, scientific temper, creativity, spirit of service, and 21st century capabilities across a range of disciplines including sciences, social sciences, arts, humanities, languages, as well as professional, technical, and vocational subjects' (Section 9.1.1). Hence, more than the creation of greater opportunities for individual employment, higher education represents the key to more vibrant, socially engaged, cooperative communities and a happier, cohesive, cultured, productive, innovative, progressive, and prosperous nation. (Section 9.1.3). NEP also identifies some of the major problems currently faced by the higher education system in India (Section 9.2) and envisions a complete overhaul and re-energizing of the higher education system to overcome these challenges and thereby deliver high-quality higher education, with equity and inclusion (Section 9.3). One of the major changes which the policy proposes is moving towards a more multidisciplinary undergraduate education (Section 9.3(b)) which develops all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner (Section 11.3). In order to achieve this in its full potential, NEP visions the adjusting of the structure and lengths of degree programmes accordingly. "The undergraduate degree will be of either 3 or 4-year duration, with multiple exit options within this period, with appropriate certifications, e.g., a certificate after completing 1 year in a discipline or field including vocational and professional areas, or a diploma after 2 years of study, or a Bachelor's degree after a 3-year programme. The 4-year multidisciplinary Bachelor's programme, however, shall be the preferred option since it allows the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of the student." (Section 11.9)

In accordance with the NEP 2020, the UGC formulated a new student-centric "Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)" incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options and establishing three Broad Pathways,

(a) 3-year UG Degree,

(b) 4-year UG Degree (Honours), and

(c) 4-year UG Degree (Honours) with Research)

Accordingly, the Kerala Higher Education Reforms Commission 2022, headed by Prof Shyam B. Menon, has recommended a comprehensive reform in the undergraduate curriculum with the adoption of the 4-year undergraduate Programmes, which will bring undergraduate education in Kerala at par with the universities abroad. Consequently, Kerala State Curriculum

Committee for Higher Education 2023 has been constituted, with Dr Suresh Das as Chairman, and they have proposed a model Kerala State Higher Education Curriculum framework for undergraduate education.

The University of Kerala has decided to introduce the Four Year Under Graduate Programmes (FYUGP) from the academic year 2024-2025 onwards in its teaching departments and all affiliated colleges, and has issued many draft documents and conducted college level awareness programmes about the same.

Mar Ivanios College, by virtue of its autonomy status, conferred in 2014 and extended in 2022, vide University Grants Commission (Conferment of Autonomous Status Upon Colleges and Measures for Maintenance of Standards in Autonomous Colleges) Regulations, 2023, has the power to review existing courses/programmes and, restructure, redesign and prescribe its own courses/programmes of study and syllabi and to formulate new courses/programmes within the nomenclature specified by UGC as per the Specification of Degrees 2014 as amended from time to time. Accordingly, the Board of Studies in Computer Science of Mar Ivanios College (Autonomous) proposed the implementation of the FYUGP scheme with effect from 2024 admission onwards and prepared the scheme and syllabi through many of the meetings and discussions. The Academic Council of the college which met on 30th April gave discussed the proposal and syllabi in detail and approved the same to be implemented from 2024 admission onwards, subject to the final directions of the University of Kerala.

The salient features of the syllabus prepared and presented by the Board of Studies include the following:

- The curriculum is designed based on Outcome Based Education (OBE) approach.
- The curriculum follows Choice-Based Credit System (CBCS): This system allows students to select courses from a prescribed list. A specified number of credits must be earned to award the degree
- The curriculum follows the basic framework, course wise/programme-wise minimum/maximum credits set by the University of Kerala for FYUGP and abides by the basic mandatory principles of **Four Year Under Graduate Programmes (UoK-FYUGP) Regulations, 2024.**
- The curriculum includes foundational subjects such as Programming in C, Data Structures and Algorithms, and Database Management Systems. These provide students with essential knowledge and skills in programming, data structures, and databases.
- The inclusion of courses like Artificial Intelligence, Machine Learning, and Deep Learning reflects the curriculum's focus on cutting-edge technologies. These areas are crucial for understanding the future of computing and data science.
- Courses like Web Development using DJANGO, React and AJAX, and Mastering Full Stack Development equip students with practical skills for creating web applications and user interfaces.

- The curriculum addresses ethical considerations and security concerns through courses like Ethics in Computing, Cyber Security, and Ethical Hacking. These topics are essential for responsible and secure technology use.
- Students learn about data exploration, mining techniques, and visualization using tools like Tableau. Additionally, Big Data Analytics and ML Pipeline and Model Management prepare them for data-driven decision-making.
- Computer Networks, Web Server Administration, and IT Infrastructure Development and Management cover essential aspects of network setup, maintenance, and infrastructure management.
- The inclusion of Multimedia and Animation Technology allows students to explore creative aspects of technology, including graphics, animation, and multimedia content.
- The curriculum integrates subjects like Philosophy of Computer Science, Design Thinking, and E-governance, emphasizing a holistic understanding of technology's impact on society and governance.
- The emphasis on hands-on experience in labs aligns with constructivist learning principles. Practical exposure enhances students' problem-solving abilities.
- By including Internships, Minor Projects, and Research Projects, the curriculum prepares students for real-world challenges and industry expectation

Graduate Attributes and Programme Outcomes (POs):

The National Higher Education Qualification Framework (NHEQF) envisages that students on completion of a programme of study must possess and demonstrate the expected graduate profile/attributes acquired through one or more modes of learning. The graduate profile/attributes indicate the quality and feature or characteristics of the graduate of a programme of study, including learning outcomes relating to the disciplinary area(s) relating to the chosen field(s) of learning and generic learning outcomes that are expected to be acquired by a graduate on completion of the programme(s) of study. The graduate profile/attributes include capabilities that help widen the current knowledge base and skills, gain and apply new knowledge and skills, undertake future studies independently, perform well in a chosen career, and play a constructive role as a responsible citizen in the society. The graduate profile/attributes are acquired incrementally and describe a set of competencies that are transferable beyond the study of a particular subject/disciplinary area and programme contexts in which they have been developed. Graduate profile/attributes are fostered through meaningful learning experiences made available through the curriculum and learning experience, the total college/university experience, and a process of critical and reflective thinking. Mar Ivanios College (Autonomous) is fully committed to ensuring the attainment of the necessary graduation attributes by the students. The college has clearly defined its raison de'tre, the philosophy of its existence, through the Motto "Truth Shall Liberate You" (Veritas Vos Liberabit) which refers to the ultimate enlightenment which can emerge only at the intersection of sharp intellect, sound physique, strong mind, staunch ethics, and profound spirituality. This

is further made explicit through its Vision, Mission and Goals and the same expect all students who graduate from the college to:

- Have inculcated "the values of truth and charity for the protection and promotion of human dignity and of a cultural heritage, through teaching, research, and extension activities dedicated to society";
- Be co-creators of a vibrant academic community known for its innovation, intellectual rigour and social commitment;
- Be "intellectually trained, morally upright, socially committed, spiritually inspired and ecologically conscious young men and women who would be dedicated to working for the good of society, the nation and the world";
- Have acquired "global competencies and skills";
- Have inculcated a sense of harmony, equality and fraternity among youth, transcending religious, linguistic, regional or sectional diversities; and
- Have developed "scientific temper, humanism and the spirit of inquiry and reform".

Programme Outcomes are the expected student attributes achieved by a student after the student completes the FYUGP from any of the streams/pathways.

The Programme Outcomes (POs) for the FYUGP programmes across all streams and pathways, based on the above core philosophy, and in consonance with the National Higher Education Qualifications Framework (NHEQF) are given below:

By the end of the Four-Year Under-Graduate Programme, students will:

PO1	**Demonstrate the acquisition of all necessary knowledge and skills within their disciplinary/ multi-disciplinary areas of learning.** These include the acquisition of: • comprehensive knowledge and coherent understanding of their chosen disciplinary/ interdisciplinary areas of study, their linkages with related fields, and the awareness of current trends in their chosen area of study; • essential knowledge for skilled work in chosen field(s), including self-employment and entrepreneurship skills; • proficiency in specialized areas within chosen fields of study, encompassing diverse practical skills applicable to different situations within those fields; • the ability to apply learned knowledge to novel situations, solve problems, and relate concepts to real-world scenarios rather than just memorizing curriculum content.
PO2	**Acquire problem-solving, critical thinking, analytical reasoning skills and demonstrate creativity in their thought processes** by demonstrating the ability to:

	• solve different kinds of problems in familiar and non-familiar contexts both within and outside their disciplinary/ multidisciplinary areas of learning; • apply analytic thought to a body of knowledge, including the analysis and evaluation of policies, and practices, as well as evidence, arguments, claims, and beliefs; • analyse and synthesize data from a variety of sources and draw valid conclusions and support them with evidence and examples. • the ability to plan, execute and report the results of an experiment or investigation; • adhere to scientific temper and ethics in their thought process; • adopt innovative, imaginative, lateral thinking, interpersonal skills and emotional intelligence; and • incubate entrepreneurial and start-up ideas.
PO3	**Develop a profound environmental dedication by fostering ecological awareness and engaging in actions that promote sustainable development** by achieving the ability to • recognize environmental and sustainability issues, and participate in actions to promote sustainable development as well as mitigate the effects of environmental degradation, climate change, and pollution; • contribute to effective waste management, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, sustainable development and living, and the preservation of life in all forms. • participate in community-engaged services/ developmental activities and thus exemplify the ideals of community engagement and service learning and deep social commitment.
PO4	**Accomplish perfect communication, teamwork, and leadership skills, particularly in academic and professional settings, while demonstrating nuance and attention to etiquette in all communicative contexts.** This will enable them to: • listen carefully, and read texts and research documents, and present complex information with clarity and precision to different audiences; • express thoughts and ideas and communicate effectively through speech and writing using appropriate media; • communicate using language which is respectful of gender and minority orientations; • act together as a group or a team in the interests of a common cause and

	working efficiently as a member of a team; • inspire the team with a vision to achieve a stated goal, and use management skills to guide the team in the right direction.
PO5	**Acquire the necessary skills, including 'learning to learn' skills, and foster innovative ideas to improve competence and employability, keeping pace with the evolving global landscape and technological advancements** by demonstrating the ability to: • pursue learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social, and cultural objectives, and adapting to changing trades and demands of the workplace, including adapting to the changes in work processes in the context of the fourth industrial revolution, through knowledge/ skill development/reskilling; • work independently, identify appropriate resources required for further learning; • acquire organizational and time management skills to set self-defined goals and targets with timelines; • be a proactive life-long learner. • use ICT in a variety of learning and work situations; • access, evaluate, and use a variety of relevant information sources, and use appropriate software for analysis of data; • navigate cyberspaces by following appropriate ethical principles and cyber etiquette. • use cutting edge AI tools with equal commitment to efficiency and ethics. • think 'out of the box' and generate solutions to complex problems in unfamiliar contexts;
PO6	**Develop research-related skills including the ability to conceptualize research hypotheses/projects and adopt suitable tools and methodologies for analysis** with: • a keen sense of observation, inquiry, and capability for asking relevant/ appropriate research questions; • the ability to problematize, synthesize, and articulate issues and design research proposals; • the ability to define problems, formulate appropriate and relevant research questions, formulate hypotheses, test hypotheses using quantitative and qualitative data, establish hypotheses, make inferences based on the analysis and interpretation of data, and predict cause-and effect relationships;

	• the capacity to develop appropriate methodology and tools for data collection; • the appropriate use of statistical and other analytical tools and techniques; • the ability to plan, execute and report the results of an experiment or investigation; • the ability to acquire the understanding of basic research ethics and skills in practicing/doing ethics in the field/ in personal research work, regardless of the funding authority or the field of study
PO7	**Assimilate a sound value system, a sense of autonomy, multicultural competence, social commitment, and the spirit of inclusivity and empathy by imbibing the spirit and the holistic ethos of the 'Multi-Dimensional Ivanian' (MDI) approach.** This will enable them to: • embrace and practice constitutional, humanistic, ethical, and moral values in life, including universal human values of integrity, truth, righteous conduct, peace, love, nonviolence, scientific temper, citizenship values; • identify ethical issues related to work, follow ethical practices and be objective, unbiased, and truthful actions in all aspects of work, including avoiding unethical behaviour such as fabrication, falsification or misrepresentation of data, or committing plagiarism, and adhering to intellectual property rights; • exercise responsibility and demonstrate accountability in applying knowledge and/or skills in work and/or learning contexts appropriate for the level of the qualification, including ensuring safety and security at workplaces; • practice responsible global citizenship required for responding to contemporary global challenges, enabling learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies; • effectively engage in a multicultural group/society and interact respectfully with diverse groups; • identify with or understand the perspective, experiences, or points of view and emotions of another individual or group. • demonstrate gender sensitivity and adopt a gender-neutral approach, as also empathy for the less advantaged and the differently-abled including those with learning disabilities; • demonstrate proficiency in arts/ sports/ games, physical, mental and emotional fitness, entrepreneurial /organizational /pubic speaking/environmental/ community-oriented areas by actively participating in the wide range of co-curricular activities that are available

	to the students of Mar Ivanios College.

Programme Specific Outcomes (PSOs)

In conformity with the POs, the Programme Specific Outcomes (PSOs) of the Major in Computer Science are drafted as given below:

PSO1	Communicate effectively, both verbally and in writing, and demonstrate ethical and professional responsibility.
PSO2	Demonstrate a profound understanding of theoretical concepts in computer science.
PSO3	Develop problem-solving skills and the ability to think critically and creatively.
PSO4	Acquire hands-on experience in various computing areas, including programming, networking, web development, and database management.
PSO5	Apply computer science concepts to solve real-world problems and adapt to the evolving nature of the field.
PSO6	Conduct independent research, showcasing a comprehensive understanding of research methodologies, data analysis, machine learning techniques, and scientific writing skills.

Course and Credit Strcuture of FYUGP

The pathway preferably followed by the department will be Major with Minor or Major with multiple disciplines of study.

The Course and Credit Strcuture of FYUGP is given below:

Sem	DSC (4 Cr)	DSE (4 Cr)	AEC (3 Cr)	SEC (3 Cr)	MDC (3 Cr)	VAC (3 Cr)	Internship (Cr -2)/ Project/ Additional Courses (Cr - 12)	Total courses	Total credits
I	A-1 B-1 C-1		AEC (Eng)-1 AEC (OL)-2		MDC-1			6	21
II	A-2 B-2 C-2		AEC (Eng)-3 AEC (OL)-4		MDC-2			6	21

III	**A-2 B-2 C-2**	**DSE-1**			**MDC-3 (Kerala Studies)**	**VAC-1**		**6**	**22**
IV	**A-4 A-5**	**DSE-2**		**SEC-1**		**VAC-2 VAC-3**	**Internship**	**6**	**23**
V	**A-6 A-7 A-8**	**DSE-3 DSE-4**		**SEC-2**				**6**	**23**
VI	**A-9 A-10 A-11**	**DSE-5 DSE-6**		**SEC-3**				**6**	**23**
Total	**A(11) B(3) C(3)**	**6**	**4**	**3**	**3**	**3**	**1***	**36**	**133**
EXIT OPTION AVAILABLE AND STUDENTS WILL BE AWARDED UG DEGREE WITH MAJOR IN A									
VII	**A-12 A-13 B/C-4 B/C-5 B/C-6**	**DSE-7**						**6**	**24**
VIII	**MOOC courses A-14 A-15**						**Research Project / Internship Project / 3 courses -12 Cr**	**2+1**/ 3*** **	**20**
Total	**A(15) B(3) C(3) B/C(3)**	**7**	**4**	**3**	**3**	**3**	**1*+1**/3*****	**44+1* + 1**/3*****	**177**

A - Major Discipline

B/C - Minor/Multiple discipline

* - Mandatory Internship at the end of Semester 4

** - Research Project/ Internship Project as part of Honours

*** - Additional courses of 4 credits each.

Cr - Credits

- **Research group project for students exiting after UG 3 years:** Students who propose to exit after 3 Year UG programme can do a group project with an extra two credits to obtain research experience in discipline-specific areas of the program. The BoS can decide the number of students for the group and the evaluation criteria.

- Students will be able to take other pathways permissible under **University of Kerala Four Year Under Graduate Programmes (UoK-FYUGP) Regulations, 2024,** subject to the availability of courses/ faculty/infrastructure of the college.

- The Board of Studies shall prepare and publish a list of online courses at different levels before the commencement of classes in the respective semester offered in various online

educational platforms recognised by the academic council of the college, which can be opted by the students for acquiring additional credits.

Course Participation/Attendance

1. A student shall be permitted to register for the end-semester evaluation of a specific course to acquire the credits only if the student has completed 75% of the prescribed classroom activities in physical, online, or blended modes, as stipulated by the BoS, including any makeup activities as specified by the faculty of that particular course.
2. The reasons/cases of permissible authorised leave shall be specified by the college, with the approval of the Academic Council, ratified by the Governing Body.
3. The condonation facility shall be availed as per the existing University/college norms.

Assessment and Evaluation

1. The assessment of a course shall combine a Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE).
2. For courses without practical/lab modules, 30% weightage shall be given for CCA and the remaining 70% of the weight shall be for the ESE.
3. CCA will have two sub-components: Formative Assessment (FA) and Summative Assessment (SA).
4. The CCA subcomponents will be given marks as per the following proportions:
    - Discipline specific summative assessment - 15% of the total
    - Course attendance (Formative) - 5% of the total.
    - Discipline specific formative assessment - 10% of the total.
5. The details of summative and formative assessment criteria, including that of attendance, will be specified by each course coordinator at the beginning of the semester, with the approval of the respective Head of the Department/BoS Chairperson and the Principal, and will be published on the college website.
6. For courses with practical/lab modules, 40% weightage shall be given for CCA and the remaining 60% of the weight shall be for the ESE.
7. In such cases specified in the item above, the CCA subcomponents will be given marks as per the following proportions:
    - Discipline specific summative assessment - 10% of the total
    - Course attendance (Formative) - 5% of the total.
    - Discipline specific formative assessment - 15% of the total.
    - Summative Assessment (Practical Record, Practical test, skill, etc). -10% of the total

The above is given in detailed tabular form as follows:

Sl. No.	Activity	Percentage(%) of the total	
		Theory Courses	Courses with practical
1.	Summative Assessment (written Test or any other discipline specific assessment tools like Open book test, Lab reports, problem-based assignments, individual or team project report, case study report, literature survey, book reviews, video/film/documentary productions, etc)	15	10
2.	Summative Assessment (Practical Record, Practical test, skill, etc)	----------	10
3.	Formative Assessment (Attendance)	5	5
4.	Formative Assessment (Class room activities, observation of skills, viva voce, quiz, interview, oral presentations, in class discussions, computerized adaptive testing, group tutorial work, reflection writing assignments, field study reports, self and peer assessments, service-learning activities, etc.)	10	15
	Total	**30**	**40**

8. The details of summative and formative assessment criteria, including that of attendance, will be specified by each course coordinator at the beginning of the semester, with the approval of the respective Head of the Department/BoS Chairperson and the Principal, and will be published on the college website.The Course Coordinator shall be responsible for evaluating all the components of CCA for the course in question. Any grievances regarding the same shall be submitted to the Course Coordinator within 5 days of the publication of the same on the department notice board or official class group. If the grievance is not settled at the Course Coordinator level, the student is free to appeal to the Head of the Department, within the next 3 days, who will discuss the same in the Department Level Monitoring Committee (DLMC). If still needed, students can further appeal to the College Level Monitoring Committee (CLMC) or in essential situations the University Level Monitoring Committee (ULMC) in a time period as specified by these bodies.
9. Regarding evaluation, one credit will be evaluated for 20 marks in a semester; thus, a 4-credit course will be evaluated for 80 marks, and 3-credit courses for 60 marks. However, any changes to this if brought by the University will be followed.
10. The duration of the end semester examination of a course with 4 credits will be 2 hours and the same for a course with 3 credits may be 1.5 hours/2 hours.

Mark Distribution Table

Course	Credit		Marks		Lecture			Practical		
					CCA (30%)		ESE (70%)	CCA (40%)		ESE (60%)
	Lecture	Practical	Lecture	Practical	SA (50%)	FA (50%)		SA (50%)	FA (50%)	
4 credit courses	4	0	80	0	12	12	56	0	0	0
	3	1	60	20	9	9	42	4	4	12
	2	2	40	40	6	6	28	8	8	24
	1	3	20	60	3	3	14	12	12	36
	0	4	0	80	0	0	0	16	16	48
3 credit courses	Credits		Marks		Lecture			Practical		
					CCA (30%)		ESE (70%)	CCA (40%)		ESE (60%)
	Lecture	Practical	Lecture	Practical	SA (50%)	FA (50%)		SA (50%)	FA (50%)	
	3	0	60	0	9	9	42	0	0	0
	2	1	40	20	6	6	28	4	4	12
	1	2	20	40	3	3	14	8	8	24
	0	3	0	60	0	0	0	12	12	36

Letter Grades and Grade Point

1. A mark system is followed to evaluate each question. For each course in the semester, letter grades and grade points are introduced in a 10-point indirect grading system as per the guidelines given below.
2. The Semester Grade Point Average (SGPA) is computed from the grades to measure the student's performance in a given semester. The SGPA is based on the current term's grades, while the Cumulative Grade Point Average (CGPA) is based on the grades in all courses taken after joining the programme of study.
3. The weighted grade point will be mentioned in the student's final grade cards, issued by the college, based on the marks obtained.
4. **The grades and grade points will be given as per the following format:**

Letter Grade	Grade Point	Percentage of marks (X) (CCA + ESE together)	Class
O (Outstanding)	10	$X \geq 95\%$	FIRST CLASS WITH DISTINCTION
A+ (Excellent)	9	$85\% \leq X < 95\%$	
A (Very Good)	8	$75\% \leq X < 85\%$	
B+ (Good)	7	$65\% \leq X < 75\%$	FIRST CLASS
B (Above Average)	6	$55\% \leq X < 65\%$	
C (Average)	5	$45\% \leq X < 55\%$	SECOND CLASS
$P\ (Pass)^{*}$	4	$35\% \leq X < 45\%$	THIRD CLASS
F (Fail)	0	$X < 35\%$	FAIL
Ab (Absent)	0		FAIL

- For a course PASS, separate minimum of 35% is needed for CCA and ESE.

- Less than 35% in either ESE or CCA is FAIL.

Computation of SGPA and CGPA

SGPA (Semester Grade Point Average) and CGPA (cumulative Grade Point Average) will be computed as follows:

1. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student in the semester. That is,

$$S_j = \frac{\sum(C_{ij} \times G_{ij})}{\sum C_{ij}}$$

where S_j is the SGPA in the j^{th} semester,
C_{ij} is the number of credits for the i^{th} course in the j^{th} semester, and
G_{ij} is the the grade point scored by the student in the i^{th} course in the j^{th} semester.

2. The CGPA is also calculated in the same manner considering all the courses undergone by a student over all the semesters of a programme. That is,

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

where S_i is the SGPA in the i^{th} semester and
$\sum C_i$ is the total number of credits in the i^{th} semester.

3. The SGPA and CGPA shall be rounded to 2 decimal points and reported in the transcripts.
4. **Requirement for the successful completion of a Semester:** SGPA of 4 or above and a PASS in all the courses, that is, minimum total of 35% mark in each course (CCA + ESE), with a separate minimum of 35% mark for both CCA and ESE. Appropriate and permissible rules of rounding off numbers may be adopted as per decisions of the Academic Council.

Prof. (Dr.) Gladston Raj S
Chairman
BoS in Computer Science
Mar Ivanios College (Autonomous)
Thiruvananthapuram

Thiruvananthapuram
10-05-2024

List of Courses

Course Code	Course Title	Course Category	Credits	Hour distribution per week		
				L	T	P
SEMESTER I | Academic Level 100-199						
MIUK1DSCCSC100.1	Programming in C	DSC	4	3	-	2
MIUK1DSCCSC101.1	Digital Marketing	DSC	4	4	-	-
MIUK1DSCCSC102.1	A Primer to Information Technology	DSC	4	4	-	-
MIUK1MDCCSC100.1	Essentials of Digital Technology	MDC	3	3	-	-
SEMESTER II | Academic Level 100-199						
MIUK2DSCCSC150.1	Art of Web Programming	DSC	4	3	-	2
MIUK2DSCCSC151.1	No Code App Development	DSC	4	3	-	2
MIUK2DSCCSC152.1	Introduction to Data Science	DSC	4	3	-	2
MIUK2MDCCSC150.1	Philosophy of Computer Science	MDC	3	3	-	-
SEMESTER III | Academic Level 200-299						
MIUK3DSCCSC200.1	Data Structures and Algorithms	DSC	4	3	-	2
MIUK3DSCCSC201.1	Free and Open Source Software	DSC	4	4	-	-
MIUK3DSCCSC202.1	Cyber Security	DSC	4	4	-	-
MIUK3DSECSC200.1	Artificial Intelligence	DSE	4	3	-	2
MIUK3DSECSC201.1	PHP and MySQL	DSE	4	3	-	2
MIUK3DSECSC202.1	IT Infrastructure Development and Management	DSE	4	3	-	2
MIUK3VACCSC200.1	Ethics in Computing	VAC	3	3	-	-

SEMESTER IV | Academic Level 200-299						
MIUK4DSCCSC250.1	Coding with Python	DSC	4	3	-	2
MIUK4DSCCSC251.1	Database Management Systems	DSC	4	3	-	2
MIUK4DSECSC250.1	Introduction to Machine Learning	DSE	4	3	-	2
MIUK4DSECSC251.1	Web Development using DJANGO	DSE	4	3	-	2
MIUK4DSECSC252.1	Data Exploration and Mining Techniques	DSE	4	3	-	2
MIUK4SECCSC250.1	Scientific Typesetting	SEC	3	2	-	2
MIUK4VACCSC250.1	Ethical hacking	VAC	3	3	-	-
MIUK4VACCSC251.1	AI for all	VAC	3	3	-	-
MIUK4INTCSC299	Internship		2			
SEMESTER V | Academic Level 300-399						
MIUK5DSCCSC300.1	Software Engineering	DSC	4	4	-	-
MIUK5DSCCSC301.1	Computer Networks	DSC	4	4	-	-
MIUK5DSCCSC302.1	Object Oriented Programming with C++	DSC	4	3	-	2
MIUK5DSECSC300.1	Machine Learning for Data Science	DSE	4	3	-	2
MIUK5DSECSC301.1	React and AJAX	DSE	4	3	-	2
MIUK5DSECSC302.1	Big Data Analytics	DSE	4	3	-	2
MIUK5DSECSC303.1	ML Pipeline and Model Management	DSE	4	3	-	2
MIUK5DSECSC304.1	Web Server Administration	DSE	4	3	-	2
MIUK5DSECSC305.1	Block Chain Technology	DSE	4	4	-	-
MIUK5SECCSC300.1	Multimedia and Animation Technology	SEC	3	2	-	2

SEMESTER VI | Academic Level 300-399						
MIUK6DSCCSC350.1	The Essentials of Operating Systems	DSC	4	4	-	-
MIUK6DSCCSC351.1	Internet of Things	DSC	4	4	-	-
MIUK6DSCCSC352.1	Object Oriented Programming with Java	DSC	4	3	-	2
MIUK6DSECSC350.1	Deep Learning	DSE	4	3	-	2
MIUK6DSECSC351.1	Mobile Application Development	DSE	4	3	-	2
MIUK6DSECSC352.1	Natural Language Processing	DSE	4	3	-	2
MIUK6DSECSC353.1	Reinforcement Learning	DSE	4	3	-	2
MIUK6DSECSC354.1	Mastering Full Stack Development	DSE	4	3	-	2
MIUK6DSECSC355.1	Software Testing	DSE	4	3	-	2
MIUK6SECCSC350.1	Data Visualization using Tableau	SEC	3	3	-	-
	Minor Project		2			
SEMESTER VII | Academic Level 400-499						
MIUK7DSCCSC400.1	Advanced Concepts in Java Programming	DSC	4	3	-	2
MIUK7DSCCSC401.1	Power of Cloud Computing	DSC	4	4		
MIUK7DSCCSC402.1	Content Management Tools	DSC	4	3	-	2
MIUK7DSCCSC403.1	E-governance	DSC	4	4	-	-
MIUK7DSCCSC404.1	Design Thinking and Problem solving	DSC	4	4	-	-
MIUK7DSCCSC405.1	Research Methodology	DSC	4	4	-	-
MIUK7DSECSC400.1	Fundamentals of Gen AI and working with Open AI	DSE	4	3	-	2
MIUK7DSECSC401.1	Emerging Trends in Web Development	DSE	4	3	-	2
MIUK7DSECSC402.1	Computer Vision	DSE	4	4	-	-

SEMESTER VIII | Academic Level 400-499						
MIUK8DSCCSC450.1	Robotics	DSC	4	4	-	-
MIUK8DSCCSC451.1	Ruby on Rails	DSC	4	3	-	2
MIUK8DSCCSC452.1	Edge Computing	DSC	4	4	-	-
	DSC (Online)					
	DSC (Online)					
MIUK8CIPCSC498	Internship Project		12			24
MIUK8RPHCSC499	Research Project		12			24

DSC – Discipline Specific Core
DSE - Discipline Specific Elective
VAC – Value Added Course
SEC – Skill Enhancement Course
MDC – Multi Disciplinary Course

COURSES OFFERED

Discipline Specific Core [DSC]

Course Code	Course Title	C
MIUK1DSCCSC100.1	**Programming in C**	**4**
MIUK1DSCCSC101.1	Digital Marketing	4
MIUK1DSCCSC102.1	A Primer to Information Technology	4
MIUK2DSCCSC150.1	**Art of Web Programming**	**4**
MIUK2DSCCSC151.1	No Code App Development	4
MIUK2DSCCSC152.1	Introduction to Data Science	4
MIUK3DSCCSC200.1	**Data Structures and Algorithms**	**4**
MIUK3DSCCSC201.1	Free and Open Source Software	4
MIUK3DSCCSC202.1	Cyber Security	4
MIUK4DSCCSC250.1	**Coding with Python**	**4**
MIUK4DSCCSC251.1	**Database Management Systems**	**4**
MIUK5DSCCSC300.1	**Software Engineering**	**4**
MIUK5DSCCSC301.1	**Computer Networks**	**4**
MIUK5DSCCSC302.1	**Object Oriented Programming with C++**	**4**
MIUK6DSCCSC350.1	**The Essentials of Operating Systems**	**4**
MIUK6DSCCSC351.1	**Internet of Things**	**4**
MIUK6DSCCSC352.1	**Object Oriented Programming with Java**	**4**
MIUK7DSCCSC400.1	**Advanced Concepts in Java Programming**	**4**
MIUK7DSCCSC401.1	**Power of Cloud Computing**	**4**
MIUK7DSCCSC402.1	Content Management Tools	4
MIUK7DSCCSC403.1	E-governance	4
MIUK7DSCCSC404.1	Design Thinking and Problem solving	4
MIUK7DSCCSC405.1	Research Methodology	4
MIUK8DSCCSC450.1	Robotics	4
MIUK8DSCCSC451.1	Ruby on Rails	4
MIUK8DSCCSC452.1	Edge Computing	4

Multi Disciplinary Course (MDC)

Course Code	Course Title	C
MIUK1MDCCSC100.1	Essentials of Digital Technology	3
MIUK2MDCCSC150.1	Philosophy of Computer Science	3

Discipline Specific Elective [DSE]

Course Code	Course Title	C
MIUK3DSECSC200.1	Artificial Intelligence	4
MIUK3DSECSC201.1	PHP and MySQL	
MIUK3DSECSC202.1	IT Infrastructure Development and Management	
MIUK4DSECSC250.1	Introduction to Machine Learning	4
MIUK4DSECSC251.1	Web Development using DJANGO	
MIUK4DSECSC252.1	Data Exploration and Mining Techniques	
MIUK5DSECSC300.1	Machine Learning for Data Science	4
MIUK5DSECSC301.1	React and AJAX	
MIUK5DSECSC302.1	Big Data Analytics	
MIUK5DSECSC303.1	ML Pipeline and Model Management	4
MIUK5DSECSC304.1	Web Server Administration	
MIUK5DSECSC305.1	Block Chain Technology	
MIUK6DSECSC350.1	Deep Learning	4
MIUK6DSECSC351.1	Mobile Application Development	
MIUK6DSECSC352.1	Natural Language Processing	
MIUK6DSECSC353.1	Reinforcement Learning	4
MIUK6DSECSC354.1	Mastering Full Stack Development	
MIUK6DSECSC355.1	Software Testing	
MIUK7DSECSC400.1	Fundamentals of Gen AI and working with Open AI	4
MIUK7DSECSC401.1	Emerging Trends in Web Development	
MIUK7DSECSC402.1	Computer Vision	

Value Added Course [VAC]

Course Code	Course Title	C
MIUK3VACCSC200.1	Ethics in Computing	3
MIUK4VACCSC250.1	Ethical hacking	3
MIUK4VACCSC251.1	AI for all	3

Skill Enhancement Course (SEC)

Course Code	Course Title	C
MIUK4SECCSC250.1	Scientific Typesetting	3
MIUK5SECCSC300.1	Multimedia and Animation Technology	3
MIUK6SECCSC350.1	Data Visualization using Tableau	3

SPECIALIZATION
[Courses to be selected from DSE]

Sl. No.	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (AI AND ML) (ANY FOUR)	WEB AND MOBILE APPLICATION DEVELOPMENT (ANY FOUR)
1	Artificial Intelligence	PHP and MySQL
2	Introduction to Machine Learning	Web Development using DJANGO
3	Machine Learning for Data Science	React and AJAX
4	ML Pipeline and Model Management	Web Server Administration
5	Deep Learning	Mobile Application Development
6	Reinforcement Learning	Mastering Full Stack Development
7	Fundamentals of Gen AI and working with Open AI	Emerging Trends in Web Development

Semester I

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK1DSCCSC100.1**				
Course Title	**PROGRAMMING IN C**				
Type of Course	**DSC**				
Semester	**I**				
Academic Level	**1**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	1. Basic understanding of computers. 2. Basics of mathematics and logic.				
Course Summary	The foundational fundamentals of programming are covered in this course. It helps students become more adept at reasoning and logical thought. The ability to design logic will enable students to write C programs and applications. Provides comprehensive C language expertise. Demonstrates how to use the C language to create programs to solve problems.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Basics of Programming**	**9**	CO1
	1	**Foundations of Programming:** Algorithms, Flow charts and Pseudo code	4 hrs	
	2	**Introduction to C Programming:** Basic Structure of the C Program, Constants, Variables and Data types, Operators and expressions, Input and Output Operations	3 hrs	

	3	**The Preprocessor:** Macro Substitution, File Inclusion – Header Files	2 hrs	
II	**Control Structures and Arrays**		**9**	CO2
	4	**Decision Making:** Decision-making and branching, Decision-making and looping	5 hrs	
	5	**Arrays:** One-dimensional Arrays -Declaration and Initialization, Two-dimensional Arrays -Declaration and Initialization, Multidimensional arrays	4 hrs	
III	**Strings and Functions**		**9**	CO3
	5	**Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen Arithmetic Operations on Characters, Putting Strings Together, String-handling Functions	4 hrs	
	6	**Functions:** Need for User-defined Functions, Elements of User-defined Functions, Definition of Functions, Function Calls, Function Declaration, Actual and Formal Arguments, Return Values and their Types Category of Functions, Nesting of Functions, Recursion, Passing Arrays to Functions, Passing Strings to Functions, The Scope, Visibility and Lifetime of Variables.	5 hrs	
IV	**Structure and Union, Pointers and Dynamic Memory Allocation**		**9**	CO4
	7	**Structures and Unions:** Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying and Comparing Structure Variables, Arrays of Structures, Arrays within Structures, Structures within Structures, Unions, Bit Fields	5 hrs	
	8	**Pointers:** Pointer Declarations, Pointer arithmetic **Dynamic Memory Allocation:** malloc, calloc, free, and realloc.	4 hrs	
V	**Flexi Module :** **File Management and Advanced Features**		**9**	CO5

	9	**File Management:** Introduction, Defining and Opening a File, Closing a File, Input/Output Operations on Files	5 hrs	
	10	**Advanced Features:** Pointers and Arrays, Pointer to an Array, Pointers and Character Strings, Array of Pointers	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. E BALAGURUSAMY, Programming in ANSI C, McGraw Hill Education(India) Pvt, Ltd., Eighth Edition, 2019 2. Ravichandran, Programming in C, New Age International Pvt. Ltd. Publishers,3rd Edition, 2017 (Unit 3 – Pointers) **Websites:** 1. https://www.programiz.com/c-programming 2. https://www.w3schools.com/c/		
Lab Exercises			**30**	
1. Programs involving input and output operations. 2. Programs utilizing conditional statements such as if, if-else, if-elsif, nested if, and switch. 3. Programs employing looping constructs like for, while, and do-while. 4. Programs focusing on arrays. 5. Programs emphasizing strings. 6. Programs showcasing user-defined functions. 7. Programs illustrating recursion. 8. Programs demonstrating structures. 9. Programs showcasing unions. 10. Programs involving dynamic memory allocation.			30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand problem-solving and create algorithms and flowcharts	U, A	PSO3
CO2	Remember C programming language basics to implement various algorithms	An,, A, C	PSO4
CO3	Apply the concept of the functional model.	A, C	PSO4

CO4	Understand heterogeneous data and pointers	U, A, C	PSO5
CO5	Apply C language's more sophisticated features.	A, C	PSO5
CO6	Ability to design and implement programs that demonstrate proficiency in C language.	C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Programming in C
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1,PO2,PO5,PO6, PSO3	U, A	C, P	L	
CO2	PO1,PO2,PO5,PO6, PSO4	An, A, C	C, P	L	
CO3	PO1,PO2,PO5,PO6, PSO4	A, C	P, M	L	
CO4	PO1,PO2,PO5,PO6, PSO5	U, A, C	P, M	L	
CO5	PO1,PO2,PO5,PO6, PSO5	A, C	P, M	L	
CO6	PO1,PO2,PO5,PO6, PSO3, PSO4,PSO5	A, C	M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	2	-	-	-
CO2	-	-	-	2	-	-
CO3	-	-	-	3	-	-
CO4	-	-	-	-	3	-
CO5	-	-	-	-	3	-
CO6	-	-	2	2	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	2	2	-
CO2	3	3	-	-	3	2	-
CO3	3	2	-	-	2	3	-
CO4	3	3	-	-	2	2	-
CO5	3	3	-	-	3	2	-
CO6	3	3	-	-	3	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓		
CO6	✓			✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK1DSCCSC101.1**				
Course Title	**DIGITAL MARKETING**				
Type of Course	**DSC**				
Semester	**I**				
Academic Level	**1** ·				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	While it is preferred for students to have a basic understanding of marketing concepts, familiarity with internet usage, and proficiency in using computers and the internet, these are not compulsory prerequisites for the course.				
Course Summary	The aim of this course is to introduce students to the idea of digital marketing and its existing and future potential developments. Additionally, it seeks to provide students with the knowledge and skills necessary to comprehend digital media platforms and use them to develop focused, and planned campaigns.				

Detailed Syllabus:

Module	Unit	Content	Hrs	
I	**Introduction**		**12**	CO1
	1	Introduction to Digital Marketing: Overview of Digital Marketing, Evolution and Importance of Digital Marketing, Digital Marketing vs. Traditional Marketing. Digital marketing strategy.	4 hrs	
	2	Search Engine Optimization: An Introduction, Search Engine Result Pages: Positioning, Search Behavior, Goals, On-Page Optimization, Off-Page Optimization, Analyze.	8 hrs	
II	**Social Media Marketing**		**12**	CO2

	3	Pay Per Click: An Introduction, Goals, Setup, Manage, Analyze	4 hrs	
	4	Social Media Marketing: An Introduction, Goals, Channels, Implementation, Analyze. Tools: Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn.	8 hrs	
III	**Email Marketing and Mobile Marketing**		**12**	CO3
	5	Email Marketing: An Introduction, Data—Email Marketing Process, Design and Content, Delivery, Discovery.	7 hrs	
	6	Mobile Marketing: An Introduction, Opportunity, Optimize, Advertise, Analyze.	5 hrs	
IV	**Analytics**		**12**	CO4
	7	Analytics: An Introduction, Goals, Setup, Monitor, Analyze.	12 hrs	
V	**Flexi Module: Emerging Trends in Digital Marketing(Optional)**		**12**	CO5
	8	Augmented reality (AR) and virtual reality (VR)	3 hrs	
	9	Voice search optimization	3 hrs	
	10	Artificial intelligence (AI)	2 hrs	
	11	Influencer marketing	2 hrs	
	12	Video Marketing	2 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Digital Marketing, Seema Gupta, McGraw Hill, 2022(Module 1) 2. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley, 2016(Module 1, 2, 3 and 4) **Websites:** 1. https://emeritus.org/in/learn/digital-marketing-trends/ 2. https://elearningindustry.com/advertise/elearning-marketing-resources/blog/what-internet-marketing-trends-can-be-expected-for-the-future 3. https://arpost.co/2021/03/16/vr-and-ar-change-marketing-2021-and-beyond/ 4. https://intellipaat.com/blog/digital-marketing-trends/ 5. https://backlinko.com/optimize-for-voice-search		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the basics of digital marketing and search engine optimization strategies	U	PSO2
CO2	Utilize social media platforms and pay-per-click advertising to achieve marketing objectives and analyze performance.	Ap	PSO3
CO3	Examine the basics of email marketing as well as the principles of mobile marketing.	An	PSO2
C04	Use analytics to measure and optimize campaigns efficiently.	Ap	PSO4
CO5	Understand emerging trends and technologies in digital marketing.	An	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Digital Marketing
Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2	U	C	L	-
CO2	PO1, PO2, PO5, PSO3	Ap	P	L	-
CO3	PO1, PO2, PO5, PSO2	An	C	L	-
C04	PO1, PO2, PO5, PSO4	Ap	P	L	-
CO5	PO1, PO2, PO5, PSO2	An	C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	2	-	-	-	-
CO2	-	-	3	-	-	-
CO3	-	2	-	-	-	-
CO4	-	-	-	3	-	-
CO5	-	2	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-
CO2	3	2	-	-	3	-	-
CO3	3	2	-	-	3	-	-
CO4	2	3	-	-	3	-	-
CO5	3	2	-	-	3	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4				✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK1DSCCSC102.1**				
Course Title	**A PRIMER TO INFORMATION TECHNOLOGY**				
Type of Course	**DSC**				
Semester	**I**				
Academic Level	**1**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge on computers, working on computers and their uses.				
Course Summary	This course is designed to introduce the basic terminology in the field of IT and to impart functional knowledge about PC hardware, operations, and concepts. This course also provides functional knowledge in using GUI and Operating Systems. In addition basic understanding of computer networks and the Internet is also provided in the course. The course also introduces the basics of Information technology and the future of the IT industry. The practical sessions introduce standard office package software like word processors, spreadsheet and Presentation software, and popular utilities.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**IT Basics and Multimedia**	**12**	CO1
	1	**Information Technology Basics:** Information, Need for information, Information Technology, Components of Information Technology, Role of Information Technology, Information Technology and the Internet, careers in IT industry.	9 hrs	
	2	**Multimedia Essentials:** Building Blocks of Multimedia – Multimedia System – Multimedia Applications – Virtual Reality.	3 hrs	

II	**Software**		**12**	
	3	**Software**-System software, Application software; concepts of files and folders. Operating systems - types of operating systems: single user, multi-tasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows &Linux (Basic desk top management); Protection. Programming Languages, Compiler, Interpreter, Databases Application softwares: Generic Features of Word processors, Spreadsheets and Presentation software, Computer Utilities and their uses.	12 hrs	CO2
III	**Computer Networks**		**12**	
	4	Computer Networks-Connecting computers, Requirements for a network: Server, Workstation, switch, router, network operating systems, Types of Computer Networks,	9 hrs	CO3
		Data Communication, Transmission Media. Types-guided/unguided	3 hrs	
IV	**Internet, Email, Computer Security**		**12**	
	5	Internet: Brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line.	3 hrs	
	6	Email: email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, introduction to HTML.	3 hrs	CO4
	7	Computer Security: Security Threats – Malicious Programs - Digital Signature – Firewall – User Identification and Authentication – Data Backup and Recovery – Security Awareness and Policies,	3 hrs	
	8	Current and Future Trends in IT: Electronic Commerce, Electronic Data Interchange, Wireless Application Protocol(WAP), Smart	3 hrs	

		Card, Blogging, RFID, BCI, Imminent Technologies.		
V	**Flexi Module : AI and Societal Impacts of IT**		**12**	CO5
	9	Artificial Intelligence: (definition and applications only): Introduction – Natural Language processing – Expert Systems – Neural Networks. Societal Impacts of IT: Role of Technology in Disaster Management - e-Governance.	12 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Introduction to Information Technology, 2nd Edition, ITL Education Solutions Limited, Pearson. 2. John D.Carpinelli, Computer systems Organization & Architecture, Pearson Education. 3. E.Balaguruswamy, Fundamentals of Computers, McGraw hill, 2014		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	To understand the basics of Information Technology and multimedia.	U	PSO2
CO2	To understand software, use operating systems, word processing, spreadsheets, and presentation software.	Ap	PSO3
CO3	To understand the basic concepts of computer networks and data communication.	U	PSO2
CO4	To understand internet connections, use e-mail, apply HTML to design web pages. To understand computer security and to analyse current and future trends in IT.	C	PSO5
CO5	To understand an overview of AI and Societal impacts of IT.	U	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: A Primer to Information Technology

Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2,PO5, PSO2	U	C	L	
CO2	PO1, PO2,PO5, PSO3	Ap	P	L	
CO3	PO1, PO2,PO5, PSO2	U	C	L	
CO4	PO1, PO2,PO5, PSO5	C	P	L	
CO5	PO1, PO2,PO5, PSO2	U	C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	-	-	-	-
CO 2	-	-	3	-	-	-
CO 3	-	3	-	-	-	-
CO 4	-	-	-	-	2	-
CO 5	-	2	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-
CO2	3	2	-	-	3	-	-
CO3	3	3	-	-	3	-	-
CO4	3	3	-	-	3	-	-
CO5	3	2	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓		

Multidisciplinary Course (MDC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK1MDCCSC100.1**				
Course Title	**ESSENTIALS OF DIGITAL TECHNOLOGY**				
Type of Course	**MDC**				
Semester	**1**				
Academic Level	**1** ·				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	Basic computer skills, critical thinking, and curiosity are key! No prior expertise needed, just a desire to explore the exciting world of digital technology**.**				
Course Summary	This course explores advanced topics in Information Technology, covering data management, social informatics, IT applications, specific areas like bioinformatics and geoinformatics, futuristic IT such as artificial intelligence, and social impacts. Understand IT strategies like				

	disaster recovery, cloud computing, and green computing. Gain insights into the digital economy, communication models, business governance, and various information systems.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Digital Knowledge Management and Social Informatics**		**9**	CO1
	1	**Knowledge Skills**: Data, Types of Data, Information and Knowledge, Knowledge management, Internet as a knowledge repository, Open access initiatives, IPR copyright and patents, Software licence agreement.	4 hrs	
	2	**Social Informatics**: Digital Society, Digital Divide, Social networks, IT- New threats, Cyber Security, Harsh realities, Guidelines for proper usage, E-Waste, Green computing, Free software Debate.	5 hrs	
II	**IT Applications**		**9**	CO2
	3	**IT Applications:** E-Governance, Overview of IT applications, IT for disabled.	4 hrs	
	4	**Specific areas:** Bio-Informatics (computational biology and bio-informatics) Scope, importance and applications), Immuno-informatics, Geo-informatics (Applications, GIS, Remote sensing, GPS, Web mapping)	5 hrs	
III	**Futuristic IT and Social Impacts**		**9**	CO3
	5	**Futuristic IT:** Artificial Intelligence, Virtual reality, Expert systems, DNA barcoding, DNA fingerprinting, Biocomputing, Biometrics.	6 hrs	
	6	**Social impacts of IT:** Introduction, Privacy, security and integrity of information, IPR, Career in IT	3 hrs	
IV	**IT in the Digital Economy and Strategies**		**9**	CO4
	7	**IT & Digital Economy:** Digital Enterprise, Digital Economy, New Communication		

		models, New Business models, New Governance Models. What is an Information system? Types of Information systems	5 hrs	
	8	**IT Strategies:** Disaster Recovery planning, Cloud computing, Green computing, Offshore outsourcing	4 hrs	
V	**Flexi Module: IT Networks and Wireless Communication**		**9**	CO5
	9	**IT Networks:** Communication systems, Data Transmission Channels, Networking Devices, Network types based on topology and graphical scope, Network Protocols and the OSI Communication Model	6 hrs	
	10	Wireless networks, Communication Service Providers and their services	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. **Chapters 2-6** of Vijayakumaran Nair K, Vinod Chandra S S, Informatics, PHI, 2014 2. **Chapter 1, 18** of Introduction to Information Technology, V.Rajaraman, PHI, Third Edition, 2018 3. **Chapter 1, 2, 7 & 13** of Information Technology, Pradeep K. Sinha, Priti Sinha, PHI, 2017		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Develop understanding of data types, knowledge management, digital society, cyber security, and ethical computing.	R, U	PSO2
CO2	Comprehend IT applications including e-governance, bioinformatics, immuno-informatics, and geo-informatics for diverse fields.	R, U	PSO2
CO3	Review futuristic IT concepts and social impacts including AI, VR, biometrics, privacy, and career prospects.	R, U	PSO2

CO4	Comprehend IT's role in digital economy, information systems, strategies like cloud computing, and outsourcing.	R, U	PSO2
CO5	Explain IT networks, protocols, wireless tech, and services offered by communication providers.	R, U	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Essentials of Digital Technology
Credits: 3:0:0 (Lecture:Tutorial:Practical)

COs	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) / Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2	U	F	L	
CO2	PO1, PO2, PO5, PSO2	U	F	L	
CO3	PO1, PO2, PO5, PSO2	U	F	L	
CO4	PO1, PO2, PO5, PSO2	U	F	L	
CO5	PO1, PO2, PO5, PSO2	U	F	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	3	-	-	-	-
CO2	-	3	-	-	-	-
CO3	-	3	-	-	-	-
CO4	-	3	-	-	-	-
CO5	-	3	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	-	-
CO2	3	3	-	-	3	-	-
CO3	3	3	-	-	3	-	-

CO4	3	3	-	-	3	-	-
CO5	3	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5		✓		

Semester II

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK2DSCCSC150.1**				
Course Title	**ART OF WEB PROGRAMMING**				
Type of Course	**DSC**				
Semester	**II**				
Academic Level	**1**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	A foundational understanding of HTML, CSS, and basic programming concepts is often beneficial for studying web programming.				
Course Summary	The Web Programming course introduces students to the fundamental concepts and technologies essential for developing dynamic and interactive websites. Participants will gain proficiency in HTML, CSS, and JavaScript, mastering the building blocks of web development. Through hands-on projects, students will develop practical skills in designing, implementing, and deploying web solutions, preparing them for a successful career in web development.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
	Introduction to HTML		**9**	
I	1	General Introduction to Internet and WWW; HTML: Structured language, Document types, Rules of html, Html tags, Structure of an HTML program, Headings, Divisions and Centering, Quotations, Text formatting, Styles, Effects. Lists, Horizontal Rules,	9 hrs	CO1

		Block level elements, Text level elements, Character entities, Comments, Fonts, Tables: Table tags and colors.		
II	**Advanced HTML**		**9**	
	2	Hyperlinks in HTML, HTML iFrames, HTML Forms - Form tag and its attributes, Get, Post, Form field elements, Form accessibility enhancements: Access key, Tooltips, Browser-specific form accessibility improvements., HTML Graphics and Media.	9 hrs	CO2
III	**CSS**		**9**	
	3	Understanding Style Sheets, CSS Syntax, Applying Style Sheets to HTML document, Developing Style Sheets: Inline, Embedded, Linking external style sheets. Positioning Elements. Backgrounds, Box Model and Text Flow. Element dimensions. CSS Selectors, Styling - Links – Lists - Tables.	9 hrs	CO3
IV	**JavaScript**		**9**	
	4	Introduction to JavaScript, Variables and data types, Declaring Variables, Operators, Control Structures, Conditional Statements, Loop Statements, Functions, Objects, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Arrays, Predefined objects, DHTML, Page Redirect, Void Keyword, Page Printing, String Methods, Error Handling, Validations, Publishing your Site, Cookies.	9 hrs	CO4
V	**Flexi Module: Document Object Model**		**9**	
	5	Introduction to the Document Object Model (DOM) - Selecting and modifying HTML elements using JavaScript - Event Handling. Asynchronous JavaScript, Working with timers, Error handling techniques.	9 hrs	CO5

Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Deitel, Internet & World Wide Web How to program, Pearson Edition, Fourth Edition. – (Unit 1) 2. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP, BPB Publication, 4th Revised Edition. – (Unit 2, 3 and 4) **Websites:** 1. https://www.w3schools.com/html/ 2. https://www.codecademy.com/ 3. https://javascript.info/

Lab Exercises	**30**	
1. Creating a structured HTML document with headings, divisions, quotations, and text formatting. 2. Building lists, horizontal rules, and block-level elements. 3. Using character entities, comments, and fonts. 4. Implementing hyperlinks and HTML iFrames. 5. Designing HTML forms with various form field elements and attributes. 6. Incorporating graphics and media elements into HTML pages. 7. Applying inline, embedded, and external style sheets to HTML documents. 8. Styling links, lists, and tables. 9. Understanding positioning, backgrounds, and the box model. 10. Using CSS selectors to target specific elements and create advanced styling effects. 11. Writing JavaScript code to declare variables and data types. 12. Implementing control structures, conditional statements, and loop statements. 13. Creating functions, objects, and working with predefined objects. 14. Handling dialog boxes (alert, confirm, prompt) and implementing validations. 15. Introduction to DOM and selecting/modifying HTML elements using JavaScript. 16. Implementing event handling	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamentals of web development and the role of HTML in creating structured web documents.	R, U	PSO2
CO2	Develop advanced web pages using HTML by incorporating hyperlinks, iFrames, HTML forms and graphics.	U, Ap	PSO2, PSO4
CO3	Demonstrate a comprehensive understanding of Cascading Style Sheets by applying CSS syntax and principles to style HTML documents effectively.	U, Ap	PSO3
CO4	Excel in JavaScript programming and enable them to develop interactive and dynamic web applications.	C	PSO5, PSO6
CO5	Manipulate the HTML elements using JavaScript and DOM.	U, Ap	PSO5, PSO6
CO6	Develop responsive and user-friendly web interfaces, employing HTML, CSS, and JavaScript	C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Art of Web Programming
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial(T)	Practical (P)
CO1	PO1,PO2,PO5, PSO2, PSO3, PSO4	R, U	F, C	L	
CO2	PO1,PO2,PO5, PSO2, PSO3, PSO4	U, Ap	C, P	L	
CO3	PO1,PO2,PO5, PSO2, PSO3, PSO4	U, Ap	C, P	L	

CO4	PO1,PO2,PO5, PSO2, PSO3, PSO4, PSO5	C	P	L	
CO5	PO1,PO2,PO5, PSO2, PSO4, PSO5	U, Ap	C, P	L	
CO6	PO1,PO2,PO5, PSO3, PSO4, PSO5	C	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	1	2	-	-
CO 2	-	2	3	3	-	-
CO 3	-	2	2	3	-	-
CO 4	-	3	2	2	1	-
CO 5	-	1	-	2	3	-
CO 6			3	3	3	

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	-	-
CO2	3	3	-	-	3	-	-
CO3	3	3	-	-	3	-	-
CO4	3	3	-	-	3	-	-
CO5	3	3	-	-	3	-	-
CO6	3	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar

- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5		✓		
CO6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK2DSCCSC151.1**				
Course Title	**NO CODE APP DEVELOPMENT**				
Type of Course	**DSC**				
Semester	**II**				
Academic Level	**1**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	Understanding the essentials of No-Code Development, Web Scraping, and App Development with the integration of ChatGPT and AI capabilities, alongside proficiently managing databases and building E-commerce applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO

I	**Foundations of No-Code Development and Web Scraping**		**9**	CO1
	1	No Code Fundamentals - What is No-Code Development? - Top Benefits and Limitations of No-Code Apps - What can you build with No-Code? - Who can use zero-code platforms? – What is the history and future of no-code? – Popular No-Code development platforms - Fundamentals of Workflow - How can workflow automation help your business? Examples of Workflow Automation.	6 hrs	
	2	Introduction to Web Scraping - What is No-Code Web Scraping? - ScrappingBee for Web scraping API	3 hrs	
II	**No Code Web Development with WebFlow and Bubble**		**9**	CO2
	3	Introduction to WebFlow - How websites are built? - Overview of Designer Interface - The Box Model - Webflows Designer - The User Interface - Changing Font Style And Elements Size - Editing Content - Editing Button And Using Classes - Changing Background Color And Size - Reusing elements with Symbols - Publishing with WebFlow	5 hrs	
	4	Introduction to Bubble - Bubble Core Concepts - What you can build with Bubble? - How to navigate Bubble.io? - Structuring a Bubble Database - Flexbox responsive design - Workflow creation in Bubble	4 hrs	
III	**App Development Essentials with ChatGPT Integration**		**9**	CO3
	5	Evolution of Mobile App Builders - The Fundamentals of Glide - Benefits of Glide for App Development - Glide App Editor Overview - Glide Settings Overview - Glide Components - Google Sheets Vs Glide Data Editor - Understanding Table Relations - Glide Actions	4 hrs	

	6	Introduction to Thunkable - Getting Started: Sign In, Creation of New Projects - App Settings, Table View - Assets, UI Components Core Blocks - OpenAI ChatGPT Integration - Publish to App and Web Store.	5 hrs	
IV	**Chatbot Development Essentials**		**9**	CO4
	7	Traditional AI Journey - Key AI Components - AI Superpowers - No-Code AI Market - Popular No-Code AI Platforms - No-Code AI Considerations - What is Google Teachable Machine? - Model Training and Testing in Google Teachable Machine - Introduction to Microsoft Lobe.ai - Lobe Overview and Tool Walkthrough - Lobe.ai Examples	4 hrs	
	8	What is a Chatbot? - How a Chatbot can improve your business? - No-Code in Chatbots - Advantages of No-code chatbot development - Popular No-code chatbot builders - How to select the right no-code AI chatbot builder? - Getting Started with Landbot - Optimize the welcome message, Add the first sequence - Ask Questions with different question types (button, button with pics, multiple choice, email)	5 hrs	
V	**Flexi Module: No-Code Database Management, E-commerce**		**9**	CO5
	9	Introduction to No-Code Databases and Automation - AirTable Sign Up and Create Database - Design the Workflow - Formula Field Type - Exporting/Importing Bases - Working with Filters - Managing Data with Groups - Sorting Functionality in AirTable - Views offered by AirTable - Kanban View, Form View, Calendar View - Working with multiple tables	5 hrs	
	10	Introduction to No-Code E-commerce App - What is Shopify? - Features of Shopify Platforms - Benefits of the Shopify platform for online store - Steps to create an online store in Shopify - Create a Shopify Account - Add	4 hrs	

		Products to the Catalog - Customizing Your Shopify Online Store and Domain Setup - Payment Processor Activation - Market and Advertise Shopify e-commerce website -		
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** Paul.E.Love, Mastering No-Code: Create Professional Quality Apps Without Coding (Vol.1), ISBN: 979-8749478402		
Lab Exercises			**30**	
1. Tour around the different No-Code Tool Landscape 2. Building Workflow Automation using Low-Code 3. Create a web scraping tool using No-Code 4. Working with the Designer interface of WebFlow 5. Create a Responsive WebPage using WebFlow 6. Using Bubble build features like sign-up forms, expense trackers, inboxes, shopping carts 7. Build a Mindfulness app using Glide 8. Build a Task Tracker App Using Glide 9. Detect and Classify Face Masks using GoogleTeachable machine. 10. Build an Image Classification Model Using Lobe.ai 11. Build a Conversational Chatbot using LandBot 12. Create a workflow in AirTable 13. Build an Online Store using Shopify 14. Develop a website using a No-Code Stack of your choice			30 hrs	CO6

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamentals of No-Code, Workflows and perform Web Scraping using a No-Code App	U, Ap	PSO1, PSO3
CO2	Build a Website using the popular No-Code Apps Webflow and Bubble.io	Ap	PSO5, PSO6
CO3	Build Mobile Apps using the popular No-Code Apps Glide and Thunkable	Ap	PSO6, PSO2

CO4	Build AI-powered apps using No-Code AI Tools	Ap	PSO2, PSO5
CO5	Use No-Code Tools to automate workflows and build E-commerce applications	Ap	PSO3, PSO4
CO6	Develop proficiency in using No-Code tools to automate workflows and create E-commerce applications	Ap	PSO4, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: No Code App Development
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1,PO2,PO5, PSO1, PSO3	U, Ap	C, P	L	
CO2	PO1,PO2,PO5, PSO5, PSO6	Ap	C, P	L	
CO3	PO1,PO2,PO5, PSO6, PSO2	Ap	C, P	L	
CO4	PO1,PO2,PO5, PSO2, PSO5	Ap	P	L	
CO5	PO1,PO2,PO5, PSO3, PSO4	Ap	P	L	
CO6	PO1,PO2,PO5, PSO4, PSO6	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	-	2	-	-	-
CO 2	-	-	-	-	3	3
CO 3	-	3	-	-	-	2
CO 4	-	3	-	-	3	-
CO 5	-	-	1	2	-	-
CO 6	-	-	-	1	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-
CO2	3	2	-	-	3	-	-
CO3	3	2	-	-	3	-	-
CO4	3	3	-	-	3	-	-
CO5	3	3	-	-	3	-	-
CO6	3	3	-	-	3	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK2DSCCSC152.1**				
Course Title	**INTRODUCTION TO DATA SCIENCE**				
Type of Course	**DSC**				
Semester	**II**				
Academic Level	**1**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	While it is preferred for students to have basic knowledge of statistics and familiarity with spreadsheet software, no prior experience in data science is required for this course.				
Course Summary	Introduction to Data Science course covers the fundamentals of data science. The course is designed for individuals to learn Techniques and Tools for Transformation of Data and empowering students with tools and techniques used in data science.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Data Science**		**9**	
	1	Introduction to Data Science, Basics of Data What is Data Science?, Data science process, Stages in a Data Science project, Applications of Data Science in various fields, Basics of Data Analytics, Types of Analytics – Descriptive, Predictive, Prescriptive, Statistical Inference - , Populations and samples	9 hrs	CO1
II	**Data Pre-processing**		**9**	
	2	Data pre-processing, Data Collection, Strategies, Data Pre-Processing Overview, Data cleaning, data integration, Data	9 hrs	CO2

		Reduction, Data Transformation and Data Discretization. Evaluation of classification methods.		
III	**Exploratory Data Analytics**		**9**	
	3	Exploratory Data Analytics-Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis,Box Plots, Correlation Analysis, Regression Analysis.	9 hrs	CO3
IV	**Data Analysis**		**9**	
	4	Data Analysis Using Spread sheet Package Defining Names in Excel, Using Excel Tables, Filtering Data in Excel. Understand Charts, Chart Design Options and Tools, Chart Format Tools, Combo Charts. Functions within Excel, Understanding Date Function, Information Functions, Logical Functions. Find and Replace, Headers and Footers, Adding Comments, Conditional Formatting. Data Validation, Sorting Data, Data Filtering Subtotals and Grouping.	9 hrs	CO4
V	**Flexi Module: Advanced Features in Spread sheet package**		**9**	
	5	Advanced Features in Spread sheet package- Data Tables in Scenario Analysis, What-if Analysis. Using Lookup Functions, Vlookups, HLookups, Match, Advanced Functions: Using Statistical Functions, Database Functions, Financial Functions.	9 hrs	CO**5**
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014. 2. Joel Grus, "Data Science from Scratch: First Principles with Python", O"Reilly Media, 2015. 3. *Microsoft Excel 2016: Comprehensive*, Freund, Starks, and Schmieder, Cengage Learning, 2017, ISBN: 9781305870727		
Lab Exercises			**30**	CO6
1. Preparation of Employee Payroll using Formulas and functions 2. Preparation of student marks statements with results using functions including decision-making operations			30 hrs	

3. Share value analysis of various companies using aggregate/statistical functions 4. Rank List preparation using Sort operation 5. Searching stock table using default filter and advanced filters 6. Stock Table searching for items using VLOOKUPS and HLOOKUPS 7. Bank Interest Computation using date and financial functions 8. Resource utilization using time analysis with time functions 9. Preparing Invoices based on sales and preparation of Sales reports 10. Creating Standard Excel Templates for routine business data management and analysis activities as a small project.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand data science process and obtain Insights About the Roles of a Data Scientist	U	PSO2
CO2	Obtain, clean/process, and transform data	Ap	PSO3
CO3	Analyze and Interpret data using an exploratory data analysis.	E	PSO4
CO4	Use of spreadsheet Excel operations to facilitate various operations on data and analysis.	C	PSO5
CO5	Mastering advanced features of spreadsheet package	C	PSO6
CO6	Apply advanced Excel skills in business activities like payroll, analysis, computation, and reporting	E,C	PSO4,PSO5,PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Introduction to Data Science
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial(T)	Practical (P)
CO1	PO1,PO2,PO5, PSO2	U	C	L	

CO2	PO1,PO2,PO5, PSO3	Ap	P	L	
CO3	PO1,PO2,PO5, PSO4	E	C	L	
CO4	PO1,PO2,PO5, PSO5	C	P	L	
CO5	PO1,PO2,PO5, PSO6	C	P	L	
CO6	PO1,PO2,PO5, PSO4, PSO5, PSO6	E,C	P,M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	-	-	-	-
CO 2	-	-	3	-	-	-
CO 3	-	-	-	3	-	-
CO 4	-	-	-	-	2	-
CO 5	-	-	-	-	-	2
CO 6				2	3	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	-	-
CO2	3	3	-	-	3	-	-
CO3	3	3	-	-	3	-	-
CO4	3	3	-	-	3	-	-
CO5	3	3	-	-	3	-	-
CO6	3	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5		✓		
CO 6	✓			

Multidisciplinary Course (MDC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK2MDCCSC150.1**				
Course Title	**PHILOSOPHY OF COMPUTER SCIENCE**				
Type of Course	**MDC**				
Semester	**II**				
Academic Level	**1** ·				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 Hours
Pre-requisites	No specific programming skills are required, but an eagerness to engage in critical thinking is essential.				
Course	Explore the intersection of philosophy and computer science in this				

Summary	dynamic course. Develop critical thinking skills through philosophical inquiry while gaining a solid foundation in computer science, engineering principles, and practical software development. The course emphasizes ethical considerations, preparing students for diverse challenges in both fields.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Philosophy and Computer Science**	**9**	CO1
	1	**Philosophy:** Introduction, A Definition of 'Philosophy', What Is Truth?, Searching for the Truth, What Is "Rational"?, Philosophy as a Personal Search, Philosophies of Anything and Everything, Philosophy and Computer Science.	4 hrs	
	2	**What Is Computer Science?** Introduction, Naming the Discipline, Why Ask What CS Is?, What Does It Mean to Ask What Something Is?, CS as the Science of Computers, CS Studies Algorithms, Physical Computers vs. Abstract Algorithms.	5 hrs	
II		**Understanding Science and Engineering in the Context of Computer Science**	**9**	CO2
	3	**Science:** Introduction, Science and Non-Science, Science as Systematic Study, The Goals of Science, Instrumentalism vs. Realism, Scientific Theories, "The" Scientific Method, Falsifiability, Scientific Revolutions, Other Alternatives, CS and Science.	6 hrs	
	4	**Engineering:** Defining 'Engineering', Engineering as Science, Brief History of Engineering, Conceptions of Engineering, What Engineers Do? The Engineering Method, Software Engineering, CS and Engineering.	3 hrs	
III		**Algorithms, Computability, and the Philosophy of Computers**	**9**	CO3
	5	**Algorithms and Computability,** Introduction, Functions and Computation, 'Algorithm' Made Precise, Five Great Insights of CS, Structured Programming, Recursive Functions, Non-Computable Functions.	6 hrs	
		Computers: A Philosophical Perspective, John	3 hrs	

	6	Searle's "Pancomputationalism": Everything Is a Computer, What Else Might Be a Computer?.		
IV	**Hypercomputation, Software, and Hardware**		**9**	CO4
	7	**Hypercomputation:** Introduction, Generic Computation, Non-Euclidean Geometries and "Non-Turing Computations", Hyper-computation, Interactive Computation, Oracle Computation, Trial-and-Error Computation.	5 hrs	
	8	**Software and Hardware:** The Nature of Computer Programs, Programs and Algorithms, Software, Programs, and Hardware, Moor: Software Is Changeable, Suber: Software Is Pattern, Colburn: Software Is a Concrete Abstraction.	4 hrs	
V	**Flexi Module: Computer Programs as Scientific Theories and Mathematical Objects**		**9**	CO5
	9	**Computer Programs as Scientific Theories:** introduction, Simulations, Computer Programs Are Theories, Computer Programs Aren't Theories.	4 Hrs	
	10	**Computer Programs as Mathematical Objects:** Introduction, Theorem Verification, Program Verification, The Fetzer Controversy, Program Verification, Models, and the World.	5 Hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. **Chapter 2-5, 7, 9, 11, 12, 14, 15** of William J. Rapaport, Philosophy of Computer Science: An Introduction to the Issues and the Literature, Wiley-Blackwell, 2023		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain deep understanding of philosophy's nature, truth, rationality, alongside computer science's foundations and algorithms.	R, U	PSO3
CO2	Explain science's principles, methods, theories, and its	R, U	PSO3

	relation to engineering and computer science.		
CO3	Grasp fundamental concepts of algorithms, computability, and the philosophical perspective on computers.	R, U	PSO3
CO4	Explore advanced topics including hypercomputation, software nature, and the interplay between programs and hardware.	R, U	PSO5
CO5	Evaluate computer programs as scientific theories and mathematical entities, examining verification methods and theoretical controversies.	R, U	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Philosophy of Computer Science
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) / Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO3	U	C	L	
CO2	PO1, PO2, PO5, PSO3	U	C	L	
CO3	PO1, PO2, PO5, PSO3	U	C	L	
CO4	PO1, PO2, PO5, PSO5	U	C	L	
CO5	PO1, PO2, PO5, PSO2	U	C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	3	-	1	-
CO2	-	1	3	-	1	-
CO3	-	-	3	-	1	-
CO4	-	1	2	-	3	-
CO5	-	3	2	-	1	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	2	-	-
CO2	3	3	-	-	2	-	-
CO3	3	3	-	-	3	-	-
CO4	3	3	-	-	3	-	-
CO5	3	3	-	-	2	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5		✓		

Semester III

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK3DSCCSC200.1**				
Course Title	**DATA STRUCTURES AND ALGORITHMS**				
Type of Course	**DSC**				
Semester	**III**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of programming in C				
Course Summary	The goal of this course is to give students a thorough understanding of basic data structures, which are crucial elements of computer science and software development. Students will gain the knowledge and abilities needed to create effective algorithms and select the right data structures to address computational issues through a combination of theoretical ideas and practical programming tasks.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction**		**9**	
	1	Basic Terminology, Classification of Data Structures, Operations on Data Structures, Abstract Data Type, Algorithms, Different Approaches to Designing an Algorithm, Control Structures Used in Algorithms, Time and Space Complexity, Big O Notation	3 hrs	CO1
	2	**Searching -** linear search and Binary Search	3 hrs	
	3	**Sorting -** Bubble Sort and Selection Sort	3 hrs	

II	**Linear Data Structures - Stack and Queue**		**9**	
	4	**Stack -** Stack ADT, Operations on Stack, Applications of Stack, Infix to postfix conversion, evaluation of expression.	5 hrs	CO2
	5	**Queue -** Queue ADT, Operations on Queue, Circular Queue, Applications of Queue	4 hrs	
III	**Linear Data Structures – List**		**9**	
	6	**Linked Lists -** Concept of static versus dynamic data structures	4 hrs	CO3
	7	**Operations on Linked List -** Creation Traversal, Insertion, Deletion, Searching, Doubly linked lists, Circular linked lists Comparison between Arrays and Linked List.	5 hrs	
IV	**Non Linear Data Structures – Trees and Graphs**		**9**	
	8	**Trees -** Basic Terminology, Binary Trees, Representation of Binary Trees, Traversal, Types of Binary Trees.	5 hrs	CO4
	9	**Graphs** - Graph Terminology, Representation of Graphs, Traversal of a Graph, Spanning Trees	4 hrs	
V	**Flexi Module: Graph Algorithms and Sets**		**9**	
	10	**MST** - MST algorithms, Shortest Path Algorithms **Sets** - Representation, Operations and Applications	9 hrs	CO5
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Reema Thareja, Data Structures Using C 3rd Edition, Oxford University Press. – Unit 1. 2. A.K.Sharma, *Data Structures Using C*, Pearson, Second edition, 2011 3. Nair A.S., Makhalekshmi,*Data Structures in C*, PHI, Third edition 2011. **Websites:** 1. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/		
Lab Exercises			**30**	CO6
1. Implementation of linear search algorithm. 2. Utilizing binary search algorithm to search for elements in a sorted array.			30 hrs	

3. Implementation of selection sort algorithm for sorting elements in an array. 4. Utilizing bubble sort algorithm to sort elements in an array. 5. Implementing basic stack operations such as push, pop, and peek. 6. Evaluating arithmetic expressions using a stack data structure. 7. Converting infix expressions to postfix notation using stack operations. 8. Implementing queue operations like enqueue and dequeue. 9. Implementation of circular queue data structure. 10. Manipulating linked lists, including insertion, deletion, and traversal. 11. Traversing trees, such as in-order, pre-order, and post-order traversal. 12. Traversing graphs, including depth-first and breadth-first traversal algorithms.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Builds the ability to analyze algorithms and perform searching and sorting.	A, An	PSO2
CO2	Apply linear data structures to problem-solving.	U, A	PSO3
CO3	Identify and apply linked lists in real-world scenarios where dynamic data structures are required.	U, A	PSO3
CO4	Gain a deep understanding of tree and graph data structures, including their properties, definitions, and classifications.	U, A	PSO4
CO5	Develop problem-solving skills by applying graph algorithms to solve complex problems, such as finding the shortest path in a graph	An	PSO5
CO6	Ability to analyze and implement fundamental algorithms and data structures commonly used in programming, including linear and binary search, selection and bubble sort, stack and queue operations, linked list manipulation, and tree and graph traversal.	C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Data Structures and Algorithms
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PSO2, PO1, PO2, PO5, PO6	A, An	C, P	L	
CO2	PSO3, PO1, PO2, PO5, PO6	U, A	P	L	
CO3	PSO3, PO1, PO2, PO5, PO6	U, A	P	L	
CO4	PSO4, PO1, PO2, PO5, PO6	U, A	C	L	
CO5	PSO5, PO1, PO2, PO5, PO6	An	P, M	L	
CO6	PSO3, PSO4, PSO5, PO1, PO2, PO5, PO6	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1		1	-	-	-	-
CO2			2-	-	-	-
CO3	-	-	3	-	-	-
CO4	-	-		2	-	-
CO5	-		-	-	3-	-
CO6	-	-	2	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	2	-
CO2	3	2	-	-	2	2	-
CO3	3	3	-	-	2	2	-
CO4	3	2	-	-	2	2	-
CO5	3	3	-	-	3	3	-
CO6	3	3	-	-	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓		
CO6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**
Course Code	**MIUK3DSCCSC201.1**
Course Title	**FREE AND OPEN SOURCE SOFTWARE**
Type of Course	**DSC**
Semester	**III**
Academic Level	**2**

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Nil				
Course Summary	This course offers a deep dive into the world of Free and Open Source Software (FOSS), exploring its history, development, and impact on society. It begins with an introduction to the concepts of Open Source, Free Software, and their distinctions, including the historical foundations laid by BSD, the Free Software Foundation, and the GNU Project. The syllabus covers methodologies, principles, and the philosophy of software freedom, alongside a critical examination of FOSS licenses, patents, and economic models. Students will assess the social and ethical implications of FOSS, understand the role of FOSS in government, and study the Linux technology through case studies. The course includes practical experience with FOSS projects like Apache, GNU/Linux, and Android, and emphasizes the importance of community collaboration. Additionally, it provides hands-on opportunities to contribute to FOSS through platforms like GitHub and Wikipedia, and delves into the broader FOSS ecosystem, including operating systems, hardware, and advanced technologies like virtualization and containerization.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Introduction to Open Source**	**12**	CO1
	1	Introduction to Open Source: Differentiating Open Source, Free Software, and Public Domain Software, Understanding that FOSS is not synonymous with 'no cost', Tracing the roots through BSD, The Free Software Foundation, and the GNU Project.	4 hrs	
	2	Methodologies and Philosophies of Open Source: A historical perspective on Open Source initiatives and principles, Exploring Software Freedom and the Open Source Development Model, Examining licenses (Apache, BSD, GPL, LGPL), copyrights, copylefts, and patents, Analyzing the economics of FOSS, including zero marginal cost and income-generation opportunities.	4 hrs	

	3	Open source vs. closed source models, The role of Open Source in government, Discussing the ethics of Open Source, Assessing the social and financial impacts of Open Source technology.	4 hrs	
II	**Practical Examples**		**12**	CO2
	4	Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, GCC, GDB, GitHub, Open Office.	6 hrs	
	5	Understanding various development models, licensing, Exploring modes of funding for Open Source projects, Open Source Hardware, Open Source Design, Open source Teaching, Open source media, The importance of collaboration, community, and communication in Open Source.	6 hrs	
III	**Contributing to Open Source**		**12**	CO3
	6	Introduction to GitHub, interacting with the community on GitHub, Communication, and etiquette, testing open source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia.	12 hrs	
IV	**Understanding Open Source Ecosystem**		**12**	CO4
	7	Exploring Open Source Operating Systems like GNU/Linux, Android, Free BSD, and Open Solaris, Open Source Hardware, Virtualization and containerization technologies such as Docker. Development Tools: Familiarization with IDEs, debuggers, programming languages, LAMP, and Open Source database technologies.	12 hrs	
V	**Flexi Module**		**12**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Text Books :** 1. Free Software, Free Society: Selected Essays of Richard M. Stallman, Richard M. Stallman. 2. Producing Open Source Software: How to Run a Successful Free Software Project by Karl Fogel. **Websites:**		

		1. https://www.gnu.org/gnu/gnu.html 2. https://opensource.com/resources 3. https://opensource.guide/

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Evaluate the distinctions, historical evolution, and economic, ethical, and societal implications of Free and Open Source Software, as well as their applications in various domains.	U	PSO1, PSO5
CO2	Analyse and apply open source development models, licensing, and funding methods, and understand the significance of collaboration, community, and communication in the creation and maintenance of open source projects such as Apache, GNU/Linux, and Android.	An	PSO2, PSO3, PSO4
CO3	Evaluate and synthesize open source software contributions, effectively communicate and collaborate using GitHub, and enhance content on platforms such as Wikipedia.	C	PSO1
CO4	Analyse the components of the open source ecosystem, including operating systems like GNU/Linux and Android, and apply virtualization and containerization technologies, as well as utilize development tools such as IDEs and open source databases.	An	PSO3, PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Free and Open Source Software
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial(T)	Practical (P)
CO1	PO1, PO2, PO5, PO6,	U	C	L	

	PSO1,PSO5				
CO2	PO1, PO2, PO5, PO6, PSO2, PSO3, PSO4	An	P	L	
CO3	PO1, PO2, PO3, PO5, PSO1	C	M	L	
CO4	PO1, PO2, PO3, PO4, PSO3, PSO4	An	C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	-	-	-	-	-
CO2	-	1	3	3	-	-
CO3	3	-	-	-	-	-
CO4	-	-	-	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2	-	-	2	2	-
CO2	3	3	-	-	2	2	-
CO3	3	2	2	-	2	-	-
CO4	3	2	1	2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK3DSCCSC202.1**				
Course Title	**CYBER SECURITY**				
Type of Course	**DSC**				
Semester	**III**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Foundational knowledge in Computers, Networking, Operating systems, Problem solving and Analytical skills				
Course Summary	The course provides a foundational knowledge on cybersecurity, best practices, prevailing laws for protection, understanding and exploration of cyber threats and vulnerabilities observed in the digital landscape				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Introduction**	**12**	CO1
	1	Information Security, importance,	3 hrs	
	2	threats- internal, external threats, threat agents, Malicious threat, non-malicious threats, threat intent	3 hrs	

	3	Cyber Security, - The C I A Triad, reasons for Cyber-crimes.	3 hrs	
	4	Importance of Cyber security, Cyber-attacks-damages, history of cyber-crime, evolution of cyber-crime, cyber-crime classification, types of cyber-crimes- categories.	3 hrs	
II	**Categories of Security**		**12**	CO2
	5	Overview on OSI layers and functions, Application Security- types, End Point Security-types, Identity and Access management, Identity management solutions and features.	3 hrs	
	6	Mobile Security, Data Security, Drive by download.	3 hrs	
	7	Infrastructure security, Disaster recovery.	3 hrs	
	8	Email Security- S/MIME. PGP, MOSS, PEM, Net Security- SSL. SHTTP, browser scripts.	3 hrs	
III	**Defending Mechanisms**		**12**	CO3
	9	Fighting Cyber-attacks- Defense in depth, Authentication.	2 hrs	
	10	**Cryptography** Symmetric encryption, advantages, disadvantages, Asymmetric Encryption, advantages, disadvantages, Comparison of Symmetric vs Asymmetric Encryption	6 hrs	
	11	Firewall, Data loss Prevention, Antivirus Solutions	1hr	
	12	Virtual Private networks	1hr	
	13	Web browsers	1hr	
	14	Data backup (Book 2)	1hr	
IV	**Security Policies**		**12**	CO4
	18	Development of Secure Information systems, key elements of information security policy, Security governance.	3 hrs	
	19	Cyber security regulations in India- IT Act 2000,2008 amendment, Information Technology Rules 2011.	3 hrs	
	20	National Cyber Security Policy 2013, Indian SPDI Act 2011 for reasonable practices, IT rules 2021. KYC, Reserve Bank of India Act 2018,	2 hrs	

		National Cyber Security Strategy 2020, Digital Data Protection Act 2023.		
	21	Indian penal Code.	2 hrs	
	22	Indian Cyber Security Regulating Bodies- Cert-In, CRAT, SEBI, IRDAI, TRAI, DoT.	2 hrs	
V	**Flexi Module : Information Security and Legal Aspects**		**12**	CO5
	23	Classification of information, Classification of Information Systems, LAN Classifications, Threats to Security, Employees, Amateur hackers and Vandals, Criminal hackers and Saboteurs, User Responsibilities.	4 hrs	
	24	Monitoring of Computer Systems, Access Control, User systems and Network access, Normal user identification, System administrator access, special access, connecting devices to networks, remote access, unauthorized remote access, Penalty for security violation.	4 hrs	
	25	Information Security Standards, ISO Copyright, patent, Governing Laws, Patent Duration, Patentable inventions, Intellectual Property Rights, Software Licensing, License Types, Semiconductor Law and patent Law, Chip Act, Reverse Engineering for Chips, Chip Act Right and Exceptions	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Fundamentals of Cyber Security Principles Theory and Practices, Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, BPB Publishers 2. Introduction to Cyber Security- Guide to the world of Cyber Security, Anand Shinde, Notion press **Websites:** 1. Cyber Laws | Ministry of Electronics and Information Technology, Government of India (meity.gov.in) 2. Indian - Computer Emergency Response Team (cert-in.org.in) 3. Top Cybersecurity Regulations in India [Updated 2023] | UpGuard		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain comprehensive knowledge of Information Security and cyber security concepts	U	PSO1
CO2	Summarize the principles in application security	U	PSO2
CO3	Identify cyber threats and solutions	An	PSO5
CO4	Determine the constructs required in developing secure information systems	An	PSO3
CO5	Understand Information Security Principles	R, U	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Cyber Security
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1,PO2, PO5, PO6, PSO1	U	C	L	-
CO2	PO1,PO2, PO5, PO6, PSO2	U	C	L	-
CO3	PO1,PO2, PO5, PO6, PSO5	An	C	L	-
CO4	PO1,PO2, PO5, PO6, PSO3	An	P	L	-
CO5	PO1,PO2, PO5, PO6, PSO2	R, U	C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1		-	-	-	-
CO 2	-	2	-	-	-	-
CO 3	-			-	3	-
CO 4	-		3	-	-	-
CO 5	-	2	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	3	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	2	2	-
CO5	3	3	-	-	3	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Discussion/Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5		✓		

Discipline Specific Elective (DSE) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK3DSECSC200.1**				
Course Title	**ARTIFICIAL INTELLIGENCE**				
Type of Course	**DSE**				
Semester	**3**				
Academic Level	**II**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	The course provides a comprehensive overview of artificial intelligence, covering intelligence components, AI technologies in business, search strategies, knowledge representation using logic, inference, learning methods including neural networks and decision trees, production systems, planning techniques, and expert systems like MYCIN and XOON-DART. It also includes a practical case study on building a simple reflex agent with Arduino, emphasizing the interaction between elements in the process.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Artificial Intelligence Defined - Academic and Industry Perspective**		**9**	CO1
	1	Overview of Intelligence - Components of Intelligence - Present and Futuristic State of AI: Use of Technologies in different sectors of Business - AI- Agents and Environments - Search strategies in AI: Uninformed Search Strategies, Uninformed Search Algorithms. Informed Search Strategies - Local Search Algorithm.	9 hrs	

II	**Knowledge Representation**		**9**	
	2	Introduction to Game Playing - Alpha Beta Pruning - Knowledge Representation using First order logic - Knowledge Engineering in First Order Logic, Proportional Logic - Proportional vs First Order Logic - Structured representation of Knowledge Using Scripts and frames.	9 hrs	CO2
III	**Inference and Learning**		**9**	
	3	Inference - Forward and Backward Chaining – Unification – Uncertainty - Inference in Bayesian Network - Learning from Observations - Forms of Learning: Inductive Learning, Neural Network-Learning Decision trees, Reinforcement Learning.	9 hrs	CO3
IV	**Production System and Planning**		**9**	
	4	Introduction to Production system - Control strategies - Rete Algorithm - Planning- STRIPS - Planning with state space search - Partial Order Planning - Planning Graphs - Uses of Planning Graphs - Planning & acting in the real world.	9 hrs	CO4
V	**Flexi Module: Expert System**		**9**	
	5	Introduction – Architecture – Role - Typical Expert System – MYCIN - XOON-DART.	5 hrs	CO5
	6	Case Study: Construction of simple reflex agent with sensor and actuator using Arduino. Elements in the Process - Interaction between elements	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 3rd Edition, Pearson Education / Prentice Hall of India, 2010. 2. Joseph C. Giarratano, Gary D. Riley,"Expert Systems : Principles and Programming",4th Edition, 2015. 3. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000. 4. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India, 2003.		

Lab Exercises	30	
1. Create a program that explores various uninformed search strategies such as breadth-first and depth-first searches. Analyze their efficiency and effectiveness in different scenarios. 2. Develop a program that utilizes informed search strategies like A* or Greedy Best-First Search. 3. Construct a knowledge base using propositional and predicate logic. 4. Design an ontology for a specific domain and illustrate how it can be used to enhance knowledge representation and retrieval in AI systems. 5. Write a program that uses scripts and frames to represent complex scenarios. 6. Develop an expert system that uses forward and backward chaining to solve problems. 7. Construct a Bayesian network for a given dataset and implement a program that performs inference to predict outcomes under uncertainty. 8. Create a decision tree algorithm to classify data. 9. Write a program that uses the Rete algorithm 10. Implement a state space search algorithm and apply it to a puzzle or problem-solving scenario. 11. Develop a simple sentiment analysis tool that categorizes text into positive, negative, or neutral sentiments.	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Get knowledge about the importance of Artificial Intelligence.	R	PSO2, PSO5
CO2	Understand and apply knowledge representation and reasoning.	Ap	PSO3, PSO5
CO3	Equip with the skills to perform logical inference, understand and apply chaining methods, handle uncertainty.	An	PSO3, PSO6
CO4	Understand and apply various planning algorithms	Ap	PSO3, PSO5
CO5	Gain comprehensive knowledge of expert systems.	U	PSO2,

			PSO5
CO6	Create a suite of programs showcasing various AI techniques.	C	PSO4, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Artificial Intelligence
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO2, PSO5	R	F	L	
CO2	PO1, PO2, PO5, PO6, PSO3, PSO5	Ap	C	L	
CO3	PO1, PO2, PO5, PO6, PSO3, PSO6	An	P	L	
CO4	PO1, PO2, PO5, PO6, PSO3, PSO5	Ap	P	L	
CO5	PO1, PO2, PO5, PO6, PSO2, PSO5	U	C	L	
CO6	PO1, PO2, PO5, PO6, PSO4, PSO6	C	M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	1	-	2	-
CO 2	-	-	3	-	3	-
CO 3	-	-	3	-	2	1
CO 4	-	-	-	-	3	-
CO 5	-	2	3	-	2	-
CO 6	1	-	3	2	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	3	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	3	2	-
CO5	3	3	-	-	2	2	-
CO6	3	3	-	-	3	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK3DSECSC201.1**				
Course Title	**PHP and MySQL**				
Type of Course	**DSE**				
Semester	**III**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	1. Proficiency in HTML and CSS for creating and styling web pages. 2. Understanding of basic programming concepts like variables, data types, control structures, and functions. 3. Basic knowledge of SQL for database querying and familiarity with web server setup and environment configuration for PHP development.				
Course Summary	This course provides a comprehensive introduction to PHP and MySQL, covering essential concepts such as variable handling, control structures, and functions in PHP, along with database design and querying using MySQL. Students will learn to develop dynamic web applications by integrating PHP with MySQL to create interactive user interfaces and manage data effectively.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to PHP**		**9**	
	1	**The building blocks of PHP:** variables, globals & super globals. **Data types:** Settype, type casting, test type, Operators & Expressions, Flow control functions in PHP, **Functions:** Defining a function variable scope, calling a function, returning values, setting default values for arguments, passing variable reference.	9 hrs	CO1

II	**Arrays, Strings, Forms**		**9**	
	2	**Arrays:** creating indexed based and associative array, accessing array, looping with indexed based array. Looping with associative array using foreach(), Array related functions. **Working with strings:** Formatting strings, indexing, strlen() functions. **Forms in PHP:** Creating a simple input form, combining HTML & PHP code on a single page, redirecting the user, creating a send mail form, File upload form.	9 hrs	CO2
III	**Files & Directories, Cookies & Sessions**		**9**	CO3
	3	**Working with file and Directories:** Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, **working with directories:** Creating and deleting folder, File Uploading & Downloading.	5 hrs	
	4	**Cookies:** Introduction, setting a cookie with PHP, deleting a cookie. **Session**: starting a session, working with session variables, passing session IDs in the query string, destroying sessions & unsetting variable.	4 hrs	
IV	**Database Connectivity with MySQL**		**9**	CO4
	5	**Open-source database software:** MySQL features, MySQL data types: Numeric, date & time, string. **Table creation in MySQL**: insert, select, where clause, ordering the result, like operator **Selecting Multiple tables:** using join, using queries **Modifying records**: update command, replace command, delete command date & time functions in MySQL. **Interacting with MySQL using PHP:** connecting to MYSQL, executing queries, retrieving error messages, inserting data with PHP, retrieving data with PHP.	9 hrs	
V	**Flexi Module:**		9	
Text	Books,	**Books:**		

Books and Materials	Articles, Readings, Software, Websites, Tutorials	1. Julie C.Meloni, PHP, MySQL and Apache,Pearson Education. 2. Ivan Byross, PHP for Beginners. 3. Matt Doyle, "Beginning PHP 5.3", 1st Edition, Wiley Publishing, Inc., 2010. **Websites:** 1. https://www.php.net/ 2. https://www.w3schools.com/php/default.asp 3. https://www.w3schools.com/mysql/mysql_intro.asp

Lab Exercises	**30**	
1. Write a Program to check and print whether a given number is even or odd. 2. Write a program to compute net amount from the given quantity purchased and rate per quantity. Discount @10% is allowed if the quantity purchased exceeds 100. 3. Write a program to find largest among three numbers using conditional operator and ternary operators. 4. Write a program to print Fibonacci series upto a given number. 5. Write a program to enter numbers till the user wants. At the end it should display the count of positive, negative and zeros entered. (Using do-while loop) 6. Write a PHP Program to demonstrate the variable function: Gettype() and Settype() 7. Write a PHP Program to demonstrate the variable unction: isset() and unset() 8. Write a function countWords ($str) that takes any string of characters and finds the Number of times each word occurs. You should ignore the distinction between capital and lowercase letters. 9. Create a form with one text field and submit buttons for string length, string reverse and uppercase, lowercase. Display the result accordingly. 10. Write a Menu-Driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on the user choice. (use switch case). 11. Write a function to swap two string values using call by value and call by references. 12. Write a program that will accept an array of integers as input, and output an array where for each item in the source array, the new array will perform the following operations: 13. For even numbers divide by 2 14. For odd numbers multiply by 3	30 hrs	CO5

15. Create a login form with two text fields called “login” and “password”. When user enters “Galgotias” as a user name and “university” as a password it should be redirected to a Welcome.HTML page or to Sorry.HTML in case of wrong username/password. 16. Write PHP code to upload image. 17. Write a PHP program to insert record into a table using MySQL. 18. Write a PHP program to delete record from a table using MySQL. 19. Write a program to update record from a table using MySQL. 20. Write a PHP program to select data from a given table and show into table format.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamental concepts and use different data types to design programs involving decisions, loops, and functions.	R, U	PSO2
CO2	Demonstrate Proficiency in Array Manipulation and String Handling in PHP.	R, U	PSO2, PSO3
CO3	Master web application state management in PHP, covering file and directory management, sessions, and cookies.	U, Ap	PSO2, PSO3
CO4	Familiar with MYSQL database and perform insert, update and delete operations on DBMS tables.	U, Ap	PSO4, PSO5
CO5	Develop proficiency in web programming using PHP, covering topics such as conditional statements, loops, string manipulation, form handling, database interactions, and user authentication.	C	PSO2,PSO4,PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PHP and MySQL
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2,PO5, PO6, PSO2	R, U	F, C	L	
CO2	PO1, PO2,PO5, PO6, PSO2, PSO3	R, U	C, P	L	
CO3	PO1, PO2,PO5, PO6, PSO2, PSO3	U, Ap	C, P	L	
CO4	PO1, PO2,PO5, PO6, PSO4, PSO5	U, Ap	P	L	
CO5	PO1, PO2,PO5, PO6, PSO2, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	1	2	-	-	-
CO 2	-	1	2	3	3	-
CO 3	-	2	2	3	3	-
CO 4	-	1	2	3	3	-
CO 5	-	1	2	3	3	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	3	2	-
CO3	3	3	-	-	2	3	-
CO4	3	3	-	-	3	3	-
CO5	3	3	-	-	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5	✓			✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK3DSECSC202.1**				
Course Title	**IT INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT**				
Type of Course	**DSE**				
Semester	**3**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic familiarity with computer science.				
Course Summary	This course is designed to provide participants with a foundational understanding of IT Infrastructure Development. Whether you are new to the field or looking to enhance your existing knowledge, this course offers a comprehensive introduction to key Infrastructure areas. The curriculum covers fundamental topics of all hardware and system software components needed to run IT applications. And infrastructure				

	architecture describes the overall design and evolution of that infrastructure.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Foundations of IT Infrastructure**		**9**	CO1
	1	Introduction to IT Infrastructure, Infrastructure Design and Issues, Infrastructure Services.	3 hrs	
	2	IT Network infrastructure management and Design guidelines, Infrastructure Requirements.	3 hrs	
	3	Computer Communication Requirements, IT Infrastructure Library.	3 hrs	
II	**IT Service Management Essentials: Delivery and Support Processes**		**9**	CO2
	4	Service Delivery Process: Introduction, Service Level Management. Capacity Management, IT Service Continuity Management, Availability Management, Service Desk.	5 hrs	
	5	Service Support Management: Service Support Process, Incident Management, Problem Management, Change Management, Release Management.	4 hrs	
III	**Storage and Security Management**		**9**	CO3
	6	Storage Management: Introduction, Hierarchical Storage Management (HSM), Data Storage, Centralized Storage and Data Management	3 hrs	
	7	Data Backup, Restoring File Security Settings, Archive or Retrieve, Disaster Recovery.	2 hrs	
	8	Space Management, Database and Application Protection, Data Retention.	2 hrs	
	9	Security Management: Introduction to Security. Goals of Security Management.	2 hrs	
IV	**Secure Identity and Access Management**		**9**	CO4

	10	Identity Management, Single Sign-On, Authentication, Authorization and Accounting (AAA), Access Management.	5 hrs	
	11	Basics of Network Security, WWW And Security.	4 hrs	
V	**Flexi Module:**		9	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Zero to Mastery in IT Infrastructure and Management – Dr.R. K Jain 2. IT Infrastructure and Management - Manoj Kumar Choubey Saurabh Singhal **Websites:** 1. https://www.spiceworks.com/tech/it-strategy/articles/what-is-it-infrastructure/#_002		

Lab Exercises	**30**	
1. Assembling hardware components 2. Installing an operating system 3. Configuring servers 4. Installing and managing a database management system 5. Configuring firewall settings.	30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the basics of IT infrastructure and demonstrate knowledge of network infrastructure management.	U	PSO1
CO2	Implement the Service Delivery Process and demonstrate understanding of Service Support Management fundamentals in practical situations.	Ap	PSO5
CO3	Illustrate Storage Management, Data backup, and Space Management concepts.	R, U	PSO2

CO4	Introduce the goals of Security Management and describe the fundamentals of Network Security.	R, U	PSO1, PSO2
CO5	Develop expertise in IT system setup, encompassing hardware assembly, OS installation, server configuration, DBMS management, and firewall setup.	Ap, C	PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: IT Infrastructure Development and Management
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2,PO5, PO6, PSO1	U	C	L	
CO2	PO1, PO2,PO5, PO6, PSO5	A	P	L	
CO3	PO1, PO2,PO5, PO6, PSO2	R, U	C	L	
CO4	PO1, PO2,PO5, PO6, PSO1, PSO2	R, U	C	L	
CO5	PO1, PO2,PO5, PO6, PSO5	Ap, C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	-	-	-	-	-
CO 2			-	-	2	-
CO 3	-	2		-	-	-
CO 4	1	2			-	-
CO 5	-		-	-	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	2	-
CO2	3	3	-	-	3	2	-
CO3	3	3	-	-	2	2	-

CO4	3	3	-	-	3	2	-
CO5	3	3	-	-	3	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3		✓		✓
CO 4		✓		✓
CO 5	✓			✓

Value Added Courses (VAC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**
Course Code	**MIUK3VACCSC200.1**
Course Title	**ETHICS IN COMPUTING**
Type of Course	**VAC**

Semester	**III**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	Nil				
Course Summary	The syllabus for ethics in computing covers a wide range of fundamental topics, providing students with a comprehensive understanding of ethical principles in the context of information technology. It offers valuable insights into ethical considerations for IT workers and users, computer and internet crime, privacy issues, and intellectual property rights. Additionally, the inclusion of case studies and examples enhances student engagement and fosters critical thinking skills. Overall, the syllabus equips students with the knowledge and skills necessary to navigate ethical dilemmas in the rapidly evolving field of computing.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Ethics**		**9**	CO1
	1	What Is Ethics? Definition of Ethics, The Importance of Integrity, The Difference Between Morals, Ethics, and Laws, Ethics in Information Technology.	2 hrs	
	2	Ethics for IT Workers and IT Users: IT Professionals- Are IT Workers Professionals?, Professional Relationships That Must Be Managed, Professional Codes of Ethics , Professional Organizations, Certification, Government Licensing.	7 hrs	
II	**Computer and Internet Crime**		**9**	CO2
	3	IT Professional Malpractice. IT Users-Common Ethical Issues for IT Users, Supporting the Ethical Practices of IT Users, Compliance. IT Security Incidents: A Major Concern, Why Computer Incidents Are So Prevalent, Types of Exploits, Types of Perpetrators, Implementing Trustworthy Computing-Risk Assessment.	9 hrs	
III	**Privacy**		**9**	

	4	Establishing a Security Policy, Educating Employees and Contract Workers, Prevention, Detection, Response. Privacy Protection, Key Privacy and Anonymity Issues.	9 hrs	CO3
IV	**Understanding Data Breaches and Intellectual Property**		**9**	
	5	Data Breaches, Electronic Discovery, Consumer Profiling, Workplace Monitoring, Advanced Surveillance Technology.	4 hrs	CO4
	6	What Is Intellectual Property? Copyrights - Copyright Term, Eligible Works, Fair Use Doctrine, Software Copyright Protection.	5 hrs	
V	**Flexi Module: Patents, Trade Secrets**		**9**	
	7	Patents - Software Patents, Cross-Licensing Agreements. Trade Secrets - Employees and Trade Secrets. Key Intellectual Property Issues – Plagiarism, Reverse Engineering, Open Source Code, Competitive Intelligence, Trademark Infringement, Cybersquatting	9 hrs	CO5
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Text Books :** 1. Ethics in Information Technology, George Reynolds, 6th Edition, Cengage Learning, 2018.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Learn about ethics in IT, including integrity, professional relationships, and compliance	U	PSO1, PSO5
CO2	Gain insights into the prevalence of computer incidents	Ap	PSO3, PSO4
CO3	Explore key issues in privacy and anonymity, consumer profiling, and surveillance	An	PSO1, PSO5

CO4	Learn the essentials of protecting privacy, handling data breaches, and understanding intellectual property rights	An	PSO4, PSO5
CO5	Acquire knowledge on intellectual property, including software patents, trade secrets, and key issues	Ap	PSO2, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Ethics in Computing
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO1, PSO5	U	C	L	
CO2	PO1, PO2, PO5, PO6, PSO3, PSO4	Ap	P	L	
CO3	PO1, PO2, PO5, PO6, PSO1, PSO5	An	C	L	
CO4	PO1, PO2, PO5, PO6, PSO4, PSO5	An	C	L	
CO5	PO1, PO2, PO5, PO6, PSO2, PSO5	Ap	C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	-	-	-	2	-
CO2	-	-	3	2	-	-
CO3	3	-	-	-	2	-
CO4	-	-	-	3	3	-
CO5	-	3	-	-	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	2	-
CO2	3	3	-	-	3	3	-
CO3	3	3	-	-	2	3	-
CO4	3	3	-	-	3	3	-
CO5	3	3	-	-	3	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Semester IV

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4DSCCSC250.1**				
Course Title	**CODING WITH PYTHON**				
Type of Course	**DSC**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	A basic understanding of fundamental programming concepts and familiarity with basic computer skills can enhance the learning experience.				
Course Summary	This course is designed to provide students with an overview of the various tools available for writing and running Python. It aims to get students coding quickly. As Python is the language of choice for data analysts and data scientists, the curriculum covers essential topics on how to use functions, methods, and packages to efficiently leverage the code needed to solve challenging problems.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
	Introduction to Python		**9**	
	1	Features of Python, How to run Python, Identifiers, Reserved Keywords, Variables, Comments, Indentation, Input, Output and Import Functions, Operators. **Data Types and Operations** - Numbers, Strings, List, Tuple, Set, Dictionary, Mutable and Immutable Objects, Data Type Conversion.	5 hrs	CO1

I	2	**Decision Making** – if statement, if..else statement, if…elif…else statement, Nested if statement. **Loops -** for loop, range() function, for loop with else statement, while loop, while loop with else statement. **Control Statements** - break Statement, continue statement, pass statement.	4 hrs	
II	**Functions and Function arguments**		**9**	CO2
	3	Definition, Function Calling. **Functions Arguments -** Required arguments, Keyword arguments, Default arguments, Variable-Length arguments. **Anonymous Functions (Lambda Functions) -** filter() function, reduce() function, Recursive Functions.	9 hrs	
III	**Modules, Packages, File Handling**		**9**	CO3
	4	**Modules & Packages -** Built-in Modules, Creating Modules, import statement, locating modules, Namespaces and Scope, dir (), reload (), Packages in Python. **File Handling**- Open, Close, Write, Read, File methods, Rename, Delete. Directories in Python.	5 hrs	
	5	**Object oriented programming**- Class, Objects, Methods, Attributes, Destructor, Encapsulation, Data hiding. **Exception handling**- built in exceptions, Handling, Exception with arguments, Raising and User defined exceptions, Assertions in Python.	4 hrs	
IV	**GUI programming and Database**		**9**	CO4
	6	**Regular expressions** – match, search, replace, patterns. **GUI programming** – Introduction, Tkinter Widgets. **Database Programming**- Establishing Connection, insert, retrieve, delete, rollback and commit operations.	9 hrs	
V	**Flexi Module:**		**9**	
Text Books and	Books, Articles, Readings,	**Books:** 1. Dr. Jeeva Jose, "Taming PYTHON By Programming", Khanna Publications, 2017.		

Materials	Software, Websites, Tutorials	**Websites:** 1. https://www.w3schools.com/python/ 2. https://www.programiz.com/python-programming

Lab Exercises	**30**	
1. Programs based on Python data structures- List, Set, Tuple, Strings. 2. Programs involving flow control statements. 3. Build the Programs using functions and recursive functions. 4. Programs on Modules and Packages. 5. Programs based on files. 6. Demonstrate classes and objects. 7. Programs on exception handling. 8. Create programs on regular expressions. 9. Programs using Tkinter widgets. 10. Develop programs on database.	30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements and functions.	R, U	PSO2
CO2	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	U, Ap	PSO2, PSO3
CO3	Articulate the object-Oriented Programming concepts and identify the commonly used operations involving file systems and Exception handling.	Ap	PSO4, PSO5
CO4	Implement regular expressions in exemplary applications related to Web services and Databases in Python.	C	PSO5, PSO6
CO5	Create diverse Python programs using different programming concepts	C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Coding with Python
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2,PO5, PO6, PSO2, PSO3	R, U	F, C	L	
CO2	PO1, PO2,PO5, PO6, PSO2, PSO3, PSO4	U, Ap	C, P	L	
CO3	PO1, PO2,PO5, PO6, PSO3, PSO4, PSO5	Ap	C, P	L	
CO4	PO1, PO2,PO5, PO6, PSO3, PSO4, PSO5, PSO6	C	P	L	
CO5	PO1, PO2,PO5, PO6, PSO3, PSO4, PSO5	C	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	1	2	-	-	-
CO 2	-	1	2	3	-	-
CO 3	-	-	2	3	3	-
CO 4	-	-	2	3	3	3
CO 5	-	-	2	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	3	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	3	3	-
CO5	3	3	-	-	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4DSCCSC251.1**				
Course Title	**DATABASE MANAGEMENT SYSTEMS**				
Type of Course	**DSC**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week

	4	3 hours	-	2 hours	5 hours
Pre-requisites	A basic understanding of data, information, file management, and software applications is beneficial.				
Course Summary	This course is designed to provide participants with a foundational understanding of the concepts and principles of DBMS, database design, data modeling, database management, and database implementation. The course also introduces SQL(Structured Query language) queries for data manipulation.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Database Fundamentals**	**9**	CO1
	1	**Concept of Relational Database** - Introduction to databases, Database environment, Evolution of database systems, Advantage of database management system.	2 hrs	
	2	**Data models** -Hierarchical data model, Network data model, ER model, Object-oriented data model, Relational model	3 hrs	
	3	Instances and schemas, Domain and attributes, tuples, keys, Integrity rules, Data independence, Database languages, Database architecture, Database users, Database administrator, Role of DBA	4 hrs	
II		**Relational Database Design and Normalization**	**9**	CO2
	4	**Relational Database design** -Concept of ER diagram, Converting ER diagrams to relational database	4 hrs	
	5	**Normalisation** - Need for normalisation, functional dependency, Normal forms-1NF,2NF,3NF,BCNF, multivalued functional dependency, 4NF and 5NF	5 hrs	
III		**SQL Basics**	**9**	CO3
	6	**Structured Query Language** -Data definition, DQL data types, Creation, insertion, viewing, updation, deletion of tables, modifying the structure of tables, renaming, dropping of tables, alter table	5 hrs	

		command, database manipulation in SQL, Computations done of table data, select command, logical operators, range searching, pattern matching, grouping data from tables in SQL, GROUP by, Having clauses		
	7	**Data Constraints:** I/O constraints, Primary key, foreign key, unique key constraints.	2 hrs	
	8	**Joins -** Joining multiple tables, Joining a table to itself	2 hrs	
IV	**Programming with SQL**		**9**	CO4
	9	**Views**- create, rename, destroy Granting and revoking permissions- granting privileges, Object privileges, revoking privileges. **Procedure** - Writing procedure and function, if, if/else, while, goto, global variables,	5 hrs	
	10	**Cursors** - Concepts of cursors, stored procedures, user-defined functions, and triggers Transactions - Concept of transaction and concurrency control, basic security issues	4 hrs	
V	**Flexi Module:** **Transactions and Concurrency Control**		**9**	CO5
	11	Transactions - Concept of transaction, Model, Storage structure, ACID properties.	5 hrs	
	12	Concurrency Control – Lock-based protocols and Deadlock handling	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education 2. Ramon A. Mata-toledo and Pauline K. Cushman, Fundamentals of Relational Data Bases, Schaum Outlines, Tata McGraw Hill 3. Abraham Silberschatz, Henry F. Korth, Database System Concepts, McGraw Hill 4. C J Date, An introduction to Database systems, Addison-Wesley Systems programming series **Websites:** 1. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/		

Lab Exercises	30	
1. SQL statement for creating, listing, dropping, checking, updating tables 2. Record manipulation using-insert, delete, update 3. Experiments that clarify the importance of keys. 4. Queries with an Expression and a column alias 5. A simple query that aggregates (groups) over a whole table 6. A query with a literal string in the SELECT list 7. Queries with sub string comparison and ordering 8. Query using the "IS NULL" syntax to list (compare '=NULL' instead of IS NULL") 9. Finding values within a certain range 10. Using the --"BETWEEN" keyword 11. SQL functions (String, Numeric, Date functions) 12. Aggregate Functions 13. A Join between two tables (Natural Join, Theta Join etc.) 14. Foreign Key 15. Nested queries 16. The EXISTS and UNIQUE function in SQL 17. Renaming attributes and joined tables 18. Statements related with VIEWs 19. Creation of stored Procedures and Execution of Procedures and Modification of Procedures. 20. Declaration of Cursor, opening a cursor, Fetch and close cursor. 21. Creation of insert trigger, delete trigger and update trigger.	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	To understand the basic concepts of data models	U	PSO2
CO2	Represent a database system using ER diagrams Implement normalization of tables	A, An,C	PSO2
CO3	Use Structured Query Language for database manipulation	A,C	PSO3,PSO4
CO4	Write simple SQL programs	A,C	PSO4
CO5	Familiarize the management of transaction processing, concurrent control techniques	U, An	PSO2

CO6	Demonstrate proficiency in SQL by utilizing statements for SQL queries and programming	C	PSO3,PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Database Management Systems
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5,PO6, PSO2	U	F, C	L	
CO2	PO1, PO2, PO5,PO6, PSO2	A, An,C	C, P	L	
CO3	PO1, PO2, PO5,PO6, PSO3, PSO4	A,C	P	L	
CO4	PO1, PO2, PO5,PO6, PSO4	A,C	p	L	
CO5	PO1, PO2, PO5,PO6, PSO2	U, An	C	L	
CO6	PO1, PO2, PO5,PO6, PSO3, PSO4	C	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1		2	-	-	-	-
CO 2		2	-	-	-	-
CO 3	-	-	3	3	-	-
CO 4	-	-		3	-	-
CO 5	-	1	-	-	-	-
CO 6	-	-	3	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	3	-

CO4	3	3	-	-	3	3	-
CO5	3	3	-	-	3	3	-
CO6	3	3	-	-	3	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓			✓

Discipline Specific Elective (DSE) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4DSECSC250.1**				
Course Title	**INTRODUCTION TO MACHINE LEARNING**				
Type of Course	**DSE**				
Semester	**4**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of programming concepts, preferably in Python, and Some exposure to statistics and data analysis techniques.				
Course Summary	Explore machine learning fundamentals, AI applications, and data essentials, including architecture, techniques, and tools like Scikit Learn and Pandas.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Machine Learning Defined - Academic and Industry Perspective**		**9**	CO1
	1	Machine Learning Academic and Industry Definition - Features of Machine Learning - Types of Machine Learning - Machine Learning Approaches - Machine Learning Techniques - Features of Machine Learning - Applications of Machine Learning -	4 hrs	
	2	Artificial Intelligence and Cognitive Technologies - Impact of Cognitive Technologies – Features – Benefits – Growth	5 hrs	

		- Role of Cognitive Technologies in an Enterprise Implementation		
II	**Machine Learning Architecture and Real World Applications**		**9**	CO2
	3	Understanding Machine Learning Architecture - Data Collection - Data Integration - Data Provisioning - Feature Engineering - Understanding Machine Learning Workflow - Problem Statement - Data Engineering - Model Engineering - Model Deployment - AI Applied in Health – Case Management Analysis - AI Applied in Health - Care Management Analysis - AI Applied in Health – Patient Readmission Analysis	9 hrs	
III	**Exploration of Machine Learning Techniques and Models**		9	CO3
	4	Machine Learning Models – Supervised - Unsupervised - Reinforcement Machine Learning Models.	4 hrs	
	5	Introduction to Machine Learning Regression Problems - Introduction to Machine Learning Classification Problems - Difference Between Regression and Classification - Linear Regression - Polynomial Regression - Ridge Regression - Lasso Regression	5 hrs	
IV	**Classification in Machine Learning: Techniques**		**9**	CO4
	6	Classification – Logistic Regression - Naïve Bayes - Random Forest – XGBoost - What Problem Does Machine Learning Solve - Getting Started with Machine Learning Problem Types - Understanding Machine Learning Problem Types - Classification Problems in Machine Learning - List of Classification Models.	9 hrs	
V	**Flexi Module: Data Collection and Software Essentials**		9	CO5
	7	Machine Learning Data Requirements - Introduction to Data Collection Strategy -	5 hrs	

		Type of Data needed - Useful Known Features - Source of Data - Amount of Data needed - Quality of Data needed - Permission to Collect and use data -		
	8	Understanding the Hardware and software Specifications - Scikit Learn – Numpy – Pandas – SciPy – Matplotlib	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Introduction to Machine Learning with Python, By Andreas C. Müller and Sarah Guido, October 2016. 2. Essential Machine Learning and Pragmatic AI, By Noah Gift, December 2018 3. Machine Learning Yearning by Andrew Ng, deeplearning.ai, 2018. 4. Hands-On Unsupervised Learning Using Python, By Ankur A. Patel, March 2019. 5. Clustering and Unsupervised Learning, By Angie Ma, Gary Willis and Alessandra Stagliano, August 2017 6. Introduction to Machine Learning, Alex Smola and S.V.N. Vishwanathan **Tutorials:** 1. Stanford Lectures of Andrew Ng.		

Lab Exercises	**30**	
1. Write a Python script to load a dataset and perform basic exploratory data analysis (EDA) using pandas and matplotlib. 2. Implement a simple "Hello World" example of a machine learning algorithm using scikit-learn. 3. Split a dataset into training and testing sets and train a supervised learning model (e.g., linear regression or decision tree). 4. Use clustering algorithms (e.g., K-means) to group data points into clusters without labels. 5. Build a classification model using logistic regression to predict the likelihood of a customer buying a product based on demographic data. 6. Identify and collect relevant datasets for a given machine learning problem statement. 7. Write Python code to scrape data from a website or API using libraries like BeautifulSoup or requests. 8. Handle missing values and perform data imputation techniques to fill in missing data.	30 hrs	CO6

9. Analyze a dataset related to healthcare case management and identify key features for predicting patient outcomes. 10. Build and evaluate machine learning models to predict patient case management outcomes (e.g., length of stay or treatment success). 11. Implement a supervised learning algorithm (e.g., decision trees or support vector machines) to predict house prices based on features such as square footage, number of bedrooms, and location. 12. Evaluate the performance of the model using metrics such as mean squared error or accuracy.		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand machine learning principles, applications, and the significance of cognitive technologies	U	PSO2, PSO5
CO2	Navigate machine learning architecture, workflow, and its real-world applications.	U	PSO3, PSO5
CO3	Gain expertise in diverse machine learning models (supervised, unsupervised, Reinforcement).	U	PSO2, PSO5
CO4	Discover basic classification techniques and problem-solving in machine learning	U	PSO3, PSO5
CO5	Understand data needs, collection strategies, and software specifications for machine learning.	U	PSO4, PSO5
CO6	Gain practical skills in loading, analyzing data, implementing basic machine learning algorithms, data preprocessing, model training, and evaluation.	Ap	PSO1, PSO3, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: **Introduction to Machine Learning**
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO2, PSO5	U	C	L	
CO2	PO1, PO2, PO5, PO6, PSO3, PSO5	U	C, P	L	
CO3	PO1, PO2, PO5, PO6, PSO2, PSO5	U	P	L	
CO4	PO1, PO2, PO5, PO6, PSO3, PSO5	U	P	L	
CO5	PO1, PO2, PO5, PO6, PSO4, PSO5	U	C	L	
CO6	PO1, PO2, PO5, PO6, PSO1, PSO3, PSO5	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	1	-
CO 2	-	-	3	-	1	-
CO 3	-	2	-	-	1	-
CO 4	-	-	2	-	1	-
CO 5	-	-	-	3	1	-
CO 6	1	-	3	-	1	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	2	3	-
CO5	3	3	-	-	3	3	-
CO6	3	3	-	-	3	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓			✓
CO4		✓		✓
CO5		✓		
CO6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**
Course Code	**MIUK4DSECSC251.1**
Course Title	**WEB DEVELOPMENT USING DJANGO**
Type of Course	**DSE**
Semester	**IV**
Academic Level	**2**

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	1. Foundational understanding of Python programming concepts is essential. 2. Basic understanding of frontend technologies and database concepts.				
Course Summary	This course provides a comprehensive introduction to building dynamic web applications with Django, a powerful Python web framework. Students will learn to create database-driven web applications, design interactive user interfaces, and implement secure authentication and authorization systems. Through hands-on projects and practical exercises, students will gain the skills and knowledge needed to develop robust, scalable, and feature-rich web applications using Django.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Django**		**9**	CO1
	1	Overview of web development frameworks - Introduction to Django framework - Installation and setup of Django - Creating a new Django project - Understanding Django's MTV architecture (Model, Template, View)	5 hrs	
	2	**Django Models:** Introduction to Django Models - Creating models to define database structure - Working with Django ORM (Object-Relational Mapping) - Defining relationships between models (One-to- one, Foreign Key, Many-to-Many) - Migrations in Django for database schema changes	4 hrs	
II	**Django Views and Templates**		**9**	CO2
	3	Understanding Views in Django - Creating and managing Django views - Introduction to Django Templates - Using template language (Django template tags and filters) - Template inheritance and reusability	5 hrs	
	4	**Django Forms:** Introduction to Django Forms - Building forms using Django Form class - Validating form data in Django -	4 hrs	

		Displaying and handling form submission - Customizing form behavior and appearance		
III	**Django Admin**		**9**	CO3
	5	Introduction to Django Admin interface - Enabling and customizing Django Admin for models - Creating custom admin actions and filters - User authentication and authorization in Django Admin	5 hrs	
	6	**Django URLs and Routing:** Understanding URL patterns in Django - URL routing and mapping to views - Working with regular expressions in URL patterns -Namespacing URL patterns for modularity	4 hrs	
IV	**Django Authentication and Authorization**		**9**	CO4
	7	Introduction to Django authentication system - User registration and login - Password management and security in Django - Role-based access control (RBAC) and permissions.	5 hrs	
	8	**Django REST Framework:** Introduction to Django REST Framework (DRF) - Building RESTful APIs using DRF - Serializers and views in DRF - Authentication and permissions in DRF.	4 hrs	
V	**Flexi Module:**		9	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. William S. Vincent, Django for APIs: Build web APIs with Python & Django, Welcometocode, 2020. 2. Andrew Pinkham, Django Unleashed, 1st Edition, Sams Publishing, 2015. 3. Julia Elman and Mark Lavin, Lightweight Django: Using REST, Web Sockets, and Backbone, 1 st Edition, Shroff/O'Reilly, 2014 **Websites:** 1. https://www.w3schools.com/python/ 2. https://www.djangoproject.com/ 3. https://developer.mozilla.org/en-US/docs/Learn/Server-side/Django		
Lab Exercises			**30**	CO5

1. Create a Django project named "myproject" and an app named "myapp." 2. Define a model named "Post" with fields for title, content, author, and publication date. 3. Create a Django admin interface for managing Post objects. 4. Implement CRUD functionality for managing Post objects using Django views and templates. 5. Add user authentication to your Django project, including user registration, login, and logout functionalities. 6. Implement user permissions to restrict access to certain views or actions based on user roles. 7. Use Django forms to create a form for adding new Post objects. 8. Implement search functionality to allow users to search for posts by title or content. 9. Create a template tag or filter to format dates in a human-readable format. 10. Implement pagination for displaying a limited number of posts per page. 11. Add comments functionality to your blog application, allowing users to add comments to posts. 12. Implement user profile pages where users can view and edit their profile information. 13. Integrate third-party authentication (e.g., OAuth) for allowing users to login using social media accounts. 14. Implement email notifications for notifying users about new comments or updates to their posts. 15. Use Django REST Framework to build a RESTful API for your application, allowing users to access and manipulate data via HTTP requests.	30 hrs	

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamental concepts and principles of web application development using the Django framework.	R, U	PSO2
CO2	Develop database-driven web applications using Django models, views, templates, and forms.	Ap	PSO3

CO3	Implement user authentication, authorization, and role-based access control (RBAC) in Django applications.	Ap	PSO4, PSO5
CO4	Design and deploy RESTful APIs using Django REST Framework for building scalable and interoperable web services.	C	PSO6
CO5	Develop a fully functional application using Django, including user authentication, CRUD functionality, search, pagination, comments, user profiles, third-party authentication, email notifications, and RESTful API integration.	C	PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Web Development Using Django
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO2, PSO3	R, U	F, C	L	
CO2	PO1, PO2, PO5, PO6, PSO2, PSO3, PSO4, PSO5	Ap	C, P	L	
CO3	PO1, PO2, PO5, PO6, PSO2, PSO3, PSO4	Ap	C, P	L	
CO4	PO1, PO2, PO5, PO6, PSO2, PSO3, PSO4, PSO5	C	P	L	
CO5	PO1, PO2, PO5, PO6, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	1	2	-	-	-
CO 2	-	1	2	3	3	-
CO 3	-	2	2	3	-	-

CO 4	-	1	2	3	3	-
CO 5	-	-	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	3	-
CO4	3	3	-	-	2	2	-
CO5	3	3	-	-	2	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO5				

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4DSECSC252.1**				
Course Title	**DATA EXPLORATION AND MINING TECHNIQUES**				
Type of Course	**DSE**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basics of Statistics and Data Base Management System.				
Course Summary	The data mining course offers an in-depth exploration of techniques for discovering patterns and relationships within large datasets. Students will learn various data mining algorithms, including classification, clustering, association rule mining, and anomaly detection. Practical exercises and real-world case studies will provide hands-on experience in applying these algorithms to solve business problems and extract valuable insights from data. By the end of the course, students will possess the skills to analyze complex datasets, uncover hidden patterns, and make informed decisions based on data-driven insights.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Introduction**	**9**	CO1
	1	Data mining application – data mining techniques – data mining case studies- the future of data mining – data mining software	2 hrs	
		Association rules mining: basics- task and a naïve algorithm- Apriori algorithm – improve the efficient of the Apriori algorithm	4 hrs	
		Mining frequent pattern without candidate generation (FP-growth)	2 hrs	
		Performance evaluation of algorithms.	1 hr	

II	**Classification & Clustering**		**9**	CO2
	2	Introduction – decision tree – over fitting and pruning - DT rules- Naive bayes method.	2 hrs	
		Estimation predictive accuracy of classification methods - other evaluation criteria for classification method classification software	2 hrs	
		Cluster analysis: cluster analysis – types of data – computing distances	1 hr	
		Types of cluster analysis methods- partitioned methods – hierarchical methods – density-based methods	2 hrs	
		Dealing with large databases – quality and validity of cluster analysis methods-cluster analysis software	2 hrs	
III	**Web Mining Applications**		**9**	CO3
	3	Introduction- web terminology and characteristics.	2 hrs	
		Locality and hierarchy in the web	1 hr	
		Web content mining-web usage mining- web structure mining.	3 hrs	
		Web mining software - Search engines: Search engines functionality- search engines architecture – ranking of web pages.	3 hrs	
IV	**Data warehousing**		**9**	CO4
	4	Introduction – Operational data sources- data warehousing.	1 hr	
		Data warehousing design – Guidelines for data warehousing implementation - Data warehousing metadata.	2 hrs	
		Online analytical processing (OLAP): Introduction – OLAP characteristics of OLAP system.	3 hrs	
		Multidimensional view and data cube - Data cube implementation - Data cube operations.	2 hrs	
		OLAP implementation guidelines	1 hr	
V	**Flexi Module:**		**9**	
Text Books and Materials	Books, Articles, Readings, Software,	**Books:** **1.** G.K. Gupta, ―Introduction to Data mining with case studies‖, 2nd Edition, PHI Private limited, New Delhi, 2011		

	Websites, Tutorials	**2.** Arun K Pujari, ―Data Mining Techniques‖, 10th impression, University Press, 2008 **Websites:** NPTEL & MOOC courses titled Data Mining **1.** https://nptel.ac.in/courses/106105174/ **2.** http://cecs.louisville.edu/datamining/PDF/0471228524.pdf

Lab Exercises	**30**	
1. Use Weka or RapidMiner to implement the Apriori algorithm for association rule mining on a dataset of retail transactions. 2. Implement FP-growth algorithm for mining frequent patterns without candidate generation using the Python library mlxtend. 3. Use scikit-learn to build a decision tree classifier and evaluate its performance on a dataset. Discuss overfitting and apply pruning techniques. 4. Implement the k-means clustering algorithm using Python's scikit-learn library and analyze the clusters formed on a dataset. 5. Web Mining Applications: 6. Use BeautifulSoup or Scrapy to extract web content from a given webpage and analyze the extracted data. 7. Implement a web usage mining algorithm such as PageRank or clickstream analysis using Python. 8. Design and implement a data warehouse schema using SQL and populate it with sample data. Use SQL queries to perform OLAP operations like roll-up, drill-down, and slice-and-dice. 9. Evaluate the performance of association rule mining algorithms (Apriori vs. FP-growth) using Python. 10. Implement partitioned clustering algorithms like k-means and hierarchical clustering using Python and compare their performance on different datasets.	30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the basics of data mining and exploration.	R, U	PSO2
CO2	Understand various data mining techniques, compare	A, Ap, E	PSO1,

	and analyse the features of each.		PSO2
CO3	Analyze interpret and mine knowledge from web sites.	An, C	PSO3, PSO4
CO4	Design, Develop and Implement Data warehousing Environment.	E, C	PSO3, PSO4, PSO5
CO5	Implement various data mining and machine learning algorithms, evaluate their performance, and apply them to real-world problems using Python libraries.	C	PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Data Exploration and Mining Techniques
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO2	R, U	F, C	L	
CO2	PO1, PO2, PO5, PO6, PSO1, PSO2	A, Ap, E	C, P	L	
CO3	PO1, PO2, PO5, PO6, PSO3, PSO4	An, C	C, P	L	
CO4	PO1, PO2, PO5, PO6, PSO3, PSO4, PSO5	E, C	P	L	
CO5	PO1, PO2, PO5, PO6, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	2	1	2	-	-
CO2	-	2	3	3	-	-
CO3	-	2	2	3	-	-
CO4	-	3	2	2	1	-

CO5	-	-	-	-	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	3	2	-
CO5	3	3	-	-	3	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4		✓		✓
CO5	✓			✓

.

Skill Enhancement Course (SEC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4SECCSC250.1**				
Course Title	**SCIENTIFIC TYPESETTING**				
SEC	**SEC**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Nil				
Course Summary	This course is tailored for students who have limited to no programming background. Its primary objectives are to introduce participants to technical writing, intricate graphics creation, and computer-based presentations utilising LaTeX.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to LaTeX**		**6**	CO1
	1	Introduction to LaTeX, Various integrated development environment (IDE) for LaTeX. Installation of TexStudio, Structure of LaTeX document, Defining class of the document through \documentclass, Packages and different environments.	2 hrs	
	2	Writing the first LaTeX content, Creating a Title, chapters and sections and their labelling, the basics of LaTeX syntax. Page style, fonts, font sizes, font styles.	4 hrs	
II	**Page Formatting**		**6**	CO2
	3	Labelling Table of Contents, font Effects, coloured text, boxes, theorems, comments &	3 hrs	

		spacing special characters, line breaking. Columns, multi-columns and minipages.		
	4	Page numbering, footnotes, headers and footers. Fancy page styles. Short cuts and definitions.	3 hrs	
III	**Tables, Pictures and Presentations**		**6**	CO3
	5	Inserting pictures and tables. Special environments enumerate, tabular, cases etc. Citation in LaTeX using BibTeX. Creating a reference database as a .bib file. Bibliography styles.	3 hrs	
	6	Presentations in LaTeX. Introduction to beamer class. Themes of beamer presentations.	3 hrs	
IV	**Mastering tikZ**		**6**	CO4
	7	Introduction to tikZ - tool to create graphic elements in LaTeX. Drawing basic shapes in tikZ.	3 hrs	
	8	Preparing book, project report in LaTeX. Familiarising Overleaf and different templates. Journal article templates in Overleaf. Creating CVs in LaTeX.	3 hrs	
V	**Flexi Module: Advanced Document Features in LaTeX**		**6**	CO5
	9	Advanced Text Formatting - font customization - Micro-typographic extensions - Creating custom commands and environments, Cross-referencing and Hyperlinks: Advanced cross-referencing - Interactive documents with hyperlinks.	6 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. **LaTeX: A Document Preparation System, Leslie** Lamport, Addison-Wesley, 1994. 2. **Guide to LaTeX** (4th Edition), Helmut Kopka and Patrick W. Daly, Addison-Wesley Professional, 2003 **Websites:** 1. https://latex-tutorial.com/tutorials/		
Lab Exercises			**30**	CO6
1. Install TexStudio on your computer and create a new LaTeX document. 2. Explore the structure of a LaTeX document and define its class using \documentclass. 3. Experiment with different LaTeX packages and environments. 4. Write a LaTeX document that includes a title, chapters, and sections with appropriate labels.			30 hrs	

5. Experiment with different page styles, fonts, font sizes, and font styles. 6. Explore techniques for line breaking, spacing, and formatting special characters. 7. Label a Table of Contents and experiment with font effects, colored text, boxes, theorems, and comments. 8. Create columns, multi-columns, and minipages within a LaTeX document. 9. Practice page numbering, footnotes, headers, and footers, and apply fancy page styles. 10. Insert pictures and tables into a LaTeX document and format them appropriately. 11. Utilize special environments such as enumerate, tabular, and cases for structured content. 12. Practice citation management using BibTeX and create a reference database as a .bib file. 13. Explore presentation creation using the beamer class in LaTeX and experiment with different themes. 14. Explore the basics of tikZ and practice drawing basic shapes in LaTeX documents. 15. Create more complex graphic elements using tikZ, such as diagrams and flowcharts. 16. Customize fonts and explore micro-typographic extensions in LaTeX. 17. Create custom commands and environments to streamline document creation. 18. Experiment with cross-referencing techniques and hyperlinks to create interactive documents.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain a foundational understanding of LaTeX as a typesetting system	U	PSO2, PSO5
CO2	Apply advanced LaTeX formatting for professional document presentation.	Ap	PSO3, PSO5
CO3	Utilize LaTeX to create structured documents, including titles, chapters, and sections, while mastering page style, fonts, and syntax	An	PSO3, PSO4

CO4	Create books, project reports, journal articles, and CVs using LaTeX effectively.	An	PSO5
CO5	Achieve proficiency in advanced LaTeX text formatting, mathematical typesetting, and document interactivity.	Ap	PSO3, PSO6
CO6	Demonstrate proficiency in LaTeX document creation, customization, and presentation.	Ap	PSO3,PSO4,PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Scientific Typesetting
Credits: 2:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PO6, PSO2, PSO5	U	C	L	
CO2	PO1, PO2, PO5, PO6, PSO3, PSO5	Ap	P	L	
CO3	PO1, PO2, PO5, PO6, PSO3, PSO4	An	C	L	
CO4	PO1, PO2, PO5, PO6, PSO5	An	C	L	
CO5	PO1, PO2, PO5, PO6, PSO3, PSO6	Ap	C	L	
CO6	PO1, PO2, PO5, PO6, PSO3, PSO4, PSO6	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	2	-	2	-
CO 2	-	-	3	-	3	-
CO 3	-	-	3	2	-	-

CO 4	-	-	-	-	3	-
CO 5	-	-	3	-	-	2
CO 6	-	-	3	3	-	1

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	2	-
CO2	3	2	-	-	2	2	-
CO3	2	2	-	-	2	2	-
CO4	3	3	-	-	2	2	-
CO5	2	2	-	-	2	2	-
CO6	2	2	-	-	2	2	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Value Added Courses (VAC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4VACCSC250.1**				
Course Title	**ETHICAL HACKING**				
Type of Course	**VAC**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	A basic understanding of computer networks, operating systems, and cybersecurity concepts is recommended, along with a willingness to explore hacking techniques and their ethical implications.				
Course Summary	This ethical hacking course introduces students to the fundamentals of cybersecurity, covering topics such as hacking techniques, information gathering, scanning, enumeration, and system hacking. Students will learn to use essential tools like Angry IP Scanner, John the Ripper, and Tor for various hacking and security assessment purposes. The course also provides insights into password cracking, privilege escalation, and basic concepts of keyloggers and spyware.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction To Hacking**		**9**	CO1
	1	Introduction to Hacking, Importance of Security, Elements of Security, Phases of hacking, Types of Hackers, Attack types.	9 hrs	
II	**Reconnaissance And Footprinting**		**9**	CO2
	2	Footprinting: Introduction, Footprinting Methodology: Footprinting through Search Engines, Footprinting using Advanced Google Hacking Techniques, Footprinting	9 hrs	

		through Social Networking Sites, Website Footprinting, Email Footprinting. WHOIS Footprinting, DNS Footprinting, Footprinting through Social Engineering, Countermeasures of Footprinting.		
III	**Scanning And Enumeration**		**9**	CO3
	3	Scanning Networks: Overview of Network Scanning, Scanning Methodology, OS Fingerprinting & Banner Grabbing.	4 hrs	
	4	Enumeration: Enumeration Concepts, NetBIOS Enumeration, SNMP Enumeration, LDAP Enumeration, NTP Enumeration, SMTP Enumeration, DNS Zone Transfer Enumeration, Enumeration Countermeasures.	5 hrs	
IV	**Vulnerability Analysis and System Hacking**		**9**	CO4
	5	Vulnerability Analysis: Vulnerability Assessment Concept: Vulnerability Assessment, Vulnerability Assessment Life-Cycle, Vulnerability Assessment Solutions, Vulnerability Scoring Systems, Vulnerability Scanning	5 hrs	
	6	System Hacking : System Hacking, Password Cracking, Escalating Privileges, Executing Applications, Hiding Files, Covering Tracks	4 hrs	
V	**Flexi Module: Malware Threats**		**9**	CO5
	7	Malware, Trojan, Virus and Worms Concepts, Virus Analysis and Detection Methods, Malware Reverse Engineering.	9 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. CEH v10: EC-Council Certified Ethical Hacker Complete Training Guide with Practice Questions & Labs, IPSpecialist LTD, 2018 2. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2009. **Websites:** 1. https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/what-is-ethical-hacking/		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Demonstrate a comprehensive understanding of hacking fundamentals.	U	PSO2
CO2	Analyse footprints using different techniques and implement strategies to protect against security risks effectively.	Ap	PSO3
CO3	Execute network scanning and enumeration techniques.	Ap	PSO4
CO4	Acquire skills in password cracking, privilege escalation, and application execution.	Ap	PSO5
CO5	Identify, analyse, and reverse engineer malware, enhancing their ability to mitigate cybersecurity threats.	An	PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Ethical Hacking
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5,PO6, PSO2	U	C	L	-
CO2	PO1, PO2, PO5,PO6, PSO3	Ap	P	L	-
CO3	PO1, PO2, PO5,PO6, PSO4	Ap	P	L	-
CO4	PO1, PO2, PO5,PO6, PSO5	Ap	P	L	-
CO5	PO1, PO2, PO5,PO6, PSO6	An	C, P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	3	-	-	-	-

CO2	-	-	3	-	-	-
CO3	-	-	-	3	-	-
CO4	-	-	-	-	3	-
CO5	-	-	-	-	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	2	-
CO4	3	3	-	-	2	2	-
CO5	3	3	-	-	2	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK4VACCSC251.1**				
Course Title	**AI FOR ALL**				
Type of Course	**MDC**				
Semester	**IV**				
Academic Level	**2**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	Nil				
Course Summary	This Introduction to Artificial Intelligence course covers the fundamentals of AI, including its history, key technologies like machine learning and natural language processing, and applications across industries such as healthcare, finance, and transportation. It also addresses ethical concerns, including bias and privacy, and explores emerging trends like AI's role in fostering creativity. By the course's end, students gain a solid understanding of AI principles and its implications for society.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Artificial Intelligence**		**9**	CO1
	1	Definition and scope of AI, Historical overview and key milestones, Differentiating AI from human intelligence	9 hrs	
II	**AI Subfields and Technologies**		**9**	CO2
	2	Machine learning: Supervised, unsupervised, and reinforcement learning, Deep learning and neural networks, Natural language processing (NLP) and computer vision	9 hrs	
III	**Applications of AI**		**9**	CO3

	3	AI in healthcare: Diagnosis, treatment, and medical imaging, AI in finance: Fraud detection, algorithmic trading, and risk assessment, AI in transportation: Autonomous vehicles and traffic optimization, AI in customer service and chatbots, AI in education: Personalized learning and intelligent tutoring systems	9 hrs	
IV	**Ethical and Social Implications of AI**		**9**	CO4
	4	Bias and fairness in AI systems, Privacy and data protection concerns, Impact of AI on employment and the workforce, AI and social inequality.	9 hrs	
V	**Flexi Module:**		**9**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Artificial Intelligence Theory, Models, and Applications Unknown Binding, P Kaliraj (Editor), T. Devi (Editor), 2021, CRC Press **Websites:** 1. https://ai.google/ 2. https://learn.microsoft.com/en-us/ai/		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Analyse the definition and scope of Artificial Intelligence, exploring its historical development and key milestones, and differentiating AI from human intelligence.	An	PSO1
CO2	Acquire basic understanding in a variety of machine learning techniques, including supervised, unsupervised, and reinforcement learning, deep learning principles, neural network architectures, natural language processing (NLP), and computer vision.	U	PSO2
CO3	Identify and analyse the diverse applications of AI,	Ap	PSO3

	ranging from healthcare and finance to transportation, customer service, and education, thereby enabling them to understand the impact of AI across various sectors		
CO4	Evaluate the ethical and social implications of AI, including issues related to bias, privacy, employment, and social inequality, empowering them to contribute to responsible AI development and deployment.	E	PSO1, PSO3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: AI for All
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5,PO6, PSO1	An	C	L	
CO2	PO1, PO2, PO5,PO6, PSO2	U	P	L	
CO3	PO1, PO2, PO5,PO6, PSO3	Ap	C	L	
CO4	PO1, PO2, PO5,PO6, PSO1, PSO3	E	M	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	-	-	-	-	-
CO 2	-	3	-	-	-	-
CO 3	-	-	3	-	-	-
CO 4	1	-	3	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	2	2	-
CO2	3	3	-	-	2	2	-
CO3	3	3	-	-	2	2	-

CO4	3	3	-	-	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓

.

Semester V

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSCCSC300.1**				
Course Title	**SOFTWARE ENGINEERING**				
Type of Course	**DSC**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic familiarity with computer systems, good problem-solving skills and knowledge in programming languages is desirable.				
Course Summary	The course deals with activities and approaches involved in the creation and development of software applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction**		**12**	**CO1**
	1	Software, characteristics, Comparison with hardware, Software Engineering- Definition, Evolution.	3 hrs	
	2	Software Process, Process vs Product vs Project.	3 hrs	
	3	Software Development Life cycle, Models- Waterfall Model- Classic. Iterative, V Model, prototyping, Evolutionary Models, Spiral, RAD Model.	3 hrs	
	4	Agile Models – categories of Agile Models (basics only), Comparison of Models.	3 hrs	
II	**Project Management and Requirements Analysis**		**12**	**CO2**

	5	Project Management- definition, complexities of software, responsibilities of a software manager, Project Planning, Software project Management Plan (SPMP)- organisation of SPMP,	3 hrs	
	6	Metrics for Project size estimation- Lines of Code, Function Point Metric, Project Estimation Techniques- Empirical- Expert Judgement, Delphi Cost Estimation, heuristic techniques- Single variable and multivariable models, Analytical techniques.	3 hrs	
	7	COCOMO- Basic COCOMO Model, Intermediate COCOMO, Complete COCOMO.	3 hrs	
	8	Requirements Analysis and Specification, Requirements Gathering and Analysis techniques, SRS, users of SRS, characteristics of a good SRS, organisation of an SRS- Functional requirements- high level requirements, Non-functional Requirements, Constraints, Goals of implementation**.**	3 hrs	
III	**Software Design**		**12**	**CO3**
	9	Software Design, outcome of design process, classification of design activities. Classification of design methodologies- procedural, object-oriented approach. Characteristics of a good design, modularity, layered approach, functional independence, cohesion, coupling, and their classifications. Function oriented approach- SA/SD methodology. Data Flow Diagrams, data dictionary, Developing DFDs of systems, context diagrams, levels of DFDs, Structured Design- transformation of DFD models to Structure Chart.	6 hrs	
	10	Object oriented approach, Object Modelling using UML, basic object-oriented concepts, relationships, advantages and disadvantages of OOD, evolution of UML.	2 hrs	
	11	Entity Relationship Models, Developing E- R Models.	2 hrs	

	12	UML diagrams, use case model, Development of use case diagram, class diagrams, interaction diagrams, activity diagrams, state chart diagram	2 hrs	
IV	**Coding and Testing**		**12**	**CO4**
	13	User interface design, characteristics of a good interface design, types of interfaces	2 hrs	
	14	Coding and Testing- coding standards, code review, software documentation.	2 hrs	
	15	Basics of testing, types of testing- white box, black box, levels of testing-unit testing, integration testing, system testing.	3 hrs	
	16	Maintenance, categories of maintenance, Reverse engineering, Re-engineering (basic concepts only).	2 hrs	
	17	Debugging- definition, Tools, Examples-GNU debugger, AndroidStudio, Python debugger Integrated Development Environments-Examples-JetBrains IDE, Visual Studio Code	3 hrs	
V	**Flexi Module**		**12**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Fundamentals of Software Engineering, Rajib Mall, Fifth edition. PHI 2. Software Engineering A Practitioner's Approach, 9th Edition, Roger S Pressman, Bruce R Maxim. Mc Graw Hill **Websites:** 1. MIT OpenCourseWare | Free Online Course Materials 2. Free | Pluralsight 3. Find the best online Programming courses and Tutorials - Hackr.io		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarize the various steps in a software development life cycle.	U	PSO-1,2
CO2	Identify steps for proper project planning and software	U, Ap	PSO-1,2

	documents preparation		
CO3	Apply various constructs to model and design software.	Ap	PSO-1,2
CO4	Develop appropriate test cases and strategies for software testing.	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Software Engineering
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO4, PO5, PSO1, PSO2	U	F, C	L	
CO2	PO1, PO2, PO4, PO5, PO6, PSO1, PSO2	U, Ap	F, C, P	L	
CO3	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PSO1, PSO2	Ap	F, C, P	L	
CO4	PO2, PO3, PO4, PO5, PO6, PO7, PSO1, PSO2	Ap	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	-	-	-	-
CO 2	2	2	-	-	-	-
CO3	2	2	-	-	-	-
CO4	2	2	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	1	2	-	-
CO2	1	3	-	1	1	1	-

CO3	1	1	-	1	3	1	-
CO4	-	1	-	1	2	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**
Course Code	**MIUK5DSCCSC301.1**
Course Title	**COMPUTER NETWORKS**
Type of Course	**DSC**
Semester	**V**
Academic Level	**3**

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic familiarity with computer science				
Course Summary	This course is designed to provide participants with a foundational understanding of essential Networking concepts and skills. Whether you are new to the field or looking to enhance your existing knowledge, this course offers a comprehensive introduction to key Networking areas. The curriculum covers fundamental topics to ensure participants gain confidence and competence in navigating the digital landscape.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Data Communications**	**12**	**CO1**
	1	Data Communications- Components, Data representation, Data flow. Introduction to Networks, Network criteria, Physical structures, Categories of Network, Interconnection of Networks. Network models - OSI model-layers, TCP/IP protocol suite. Physical layer and Media- Data and signals- Digital Transmission , Analog Transmission, Multiplexing- FDM, TDM, WDM. Transmission Media-Guided and Unguided. Switching- circuit switched Network, packet switched network, message switched network.	12 hrs	
II		**Data Link Layer**	**12**	**CO2**
	2	Data Link Layer-Error Detection and correction-types of Errors, Block coding, Hamming distance, Cyclic Codes, Checksum. Multiple Access Protocols - ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA, Ethernet-categories of Ethernet, Fast Ethernet.	12 hrs	
III		**Network Layer**	**12**	**CO3**

	3	Network Layer-Logical Addressing, IPV4, IPV6. Network Layer- Forwarding, Unicast Routing Protocols- Distance vector routing, path vector routing, Multicast Routing Protocols.	12 hrs	
IV	**Transport Layer**		**12**	**CO4**
	4	Transport layer- Process to Process delivery- UDP, TCP, congestion control and Quality of Service -techniques to improve Quality of service. Application Layer- Domain Name System, FTP, TELNET, Electronic Mail, WWW, HTTP.	12 hrs	
V	**Flexi Module:**		**12**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Behrouz A. Forouzan, Data Communications and Networking, McGraw-Hill Education (India) Pvt. Ltd. 2. Andrew S. Tanenbaum, Computer Networks, Pearson Education India **Websites:** Computer Network Tutorial - javatpoint		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Remember various network technologies, design issues and characteristics	R	PSO2
CO2	Understand the data link layer and analyze different types of errors, error correction and detection.	An	PSO3
CO3	Create awareness on network layer and different networking protocols.	C	PSO2
CO4	Understand the main design issues of transport protocols and the mechanism to control traffic flow and congestion.	A	PSO3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Computer Networks
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO3, PO4, PO5, PSO2	R	C	L	
CO2	PO2, PSO3	An	P	L	
CO3	PO2, PO4, PO6, PSO2	C	C	L	
CO4	PO2, PO4, PO5, PSO3	A	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	-	2		-	-
CO 3	-	2	-	-	-	-
CO 4	-	-	3	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	-	-	3	-	-
CO2	1	2	-	-	3	-	-
CO3	-	1	-	-	-	-	-
CO4	-	2	-	-	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓		✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSCCSC302.1**				
Course Title	**OBJECT ORIENTED PROGRAMMING WITH C++**				
Type of Course	**DSC**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	A basic understanding of programming concepts and familiarity with a programming language, preferably C, is recommended but not mandatory prerequisites for this course.				
Course Summary	This course covers the fundamentals of object-oriented programming (OOP) and C++ basics, starting with an introduction to OOP principles such as encapsulation, inheritance, and polymorphism. It then progresses to cover C++ programming basics, control structures, functions, and classes and objects. The course delves into advanced topics including inheritance, memory management, binding, polymorphism, and exception handling. Additionally, it explores file operations, including I/O operations, file pointers, and error handling. Throughout the course,				

	students gain practical experience through exercises and assignments aimed at applying these concepts in real-world scenarios.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to OOP and Basics of C++**		**9**	CO1
	1	Introduction to Object Orientation: Explanation of why related data and methods should be kept as a single unit. Comparison with procedural and structured programming paradigms. Understanding classes and objects, data abstraction, encapsulation, inheritance, polymorphism, dynamic binding, and message passing. Advantages of object orientation including reusability, maintenance, security, and ease of programming.	2 hrs	
	2	C++ Programming basics: Data types, variables, and constants.	1 hr	
	3	Control structures: loops (for, while, do-while) and decision-making (if-else, switch-case), Arrays and strings.	2 hrs	
	4	Functions, Returning values from functions, Reference arguments, Overloaded function, Inline function, Default arguments, Returning by reference.	4 hrs	
II	**Classes and Objects**		**9**	CO2
	5	Classes and objects, Access modifiers, static members, friend functions, constructors and destructors.	4 hrs	
	6	Polymorphism, operator overloading, and type conversion. Introduction to anonymous objects.	5 hrs	
III	**Inheritance and Memory Management**		**9**	CO3
	7	Understanding inheritance: parent and child classes, private, public, and protected inheritance, multiple inheritance, and multi-level inheritance. Concepts of virtual base classes.	6 hrs	

	8	Memory management in C++: new and delete operators, dynamic memory allocation.	3 hrs	
IV	**Binding, Polymorphism and Exception Handling**		**9**	CO4
	9	Early binding and late binding, Understanding pointers to derived class objects, virtual functions, pure virtual functions, abstract classes, object slicing.	5 hrs	
	10	Exception handling in C++ using try, throw, and catch statements.	4 hrs	
V	**Flexi Module: Streams and Files**		**9**	CO5
	11	I/O Operations and Files: C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File : open() and close() functions.	3 hrs	
	12	Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions	2 hrs	
	13	Sequential Input and output Operations : put (), get(), write(), read() functions	2 hrs	
	14	Error handling File Operations : eof(), fail(), bad(), good()	2 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. E. Balagurusamy - Object Oriented Programming with C++ - TMH. 2. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, Pearson 3. H M Deitel and P J Deitel, C++: how to program, Pearson Education		

Lab Exercises	**30**
1. Declare variables of different data types (int, float, char, double) and initialize them with sample values. Print the variables to the console. 2. Define constants for PI and G (gravity), then calculate the area of a circle and the weight of an object on Earth given its mass. 3. Write a program to print the Fibonacci series using a for loop. 4. Implement a simple calculator program using switch-case for addition, subtraction, multiplication, and division operations. 5. Write a function to find the factorial of a number. Test the function with different input values.	

6. Create a function to swap the values of two variables using pass-by-reference. 7. Overload a function to calculate the area of a rectangle and a circle. 8. Write an inline function to find the square of a number. 9. Create a function that calculates the area of a rectangle with default values for length and width. 10. Define a class representing a Point with x and y coordinates. Include methods to set and get coordinates, calculate distance, and display the point. 11. Create a class representing a BankAccount with private member variables for account number, balance, and owner name. Include methods for deposit, withdrawal, and display balance. Implement a static member to track the total number of accounts. 12. Define a class representing a Rectangle with length and width as private members. Implement constructors to initialize the rectangle with default and given values. Also, include a destructor to display a message when an object is destroyed. 13. Create a base class Animal with methods speak() and eat(). Derive classes Dog and Cat from Animal. Override the speak() method for each derived class. 14. Overload the '+' operator for a Complex class to add two complex numbers. 15. Implement a class representing a Distance (in feet and inches) and overload the '+' operator to add two Distance objects. 16. Define a base class Shape with a virtual function area(). Derive classes Circle and Rectangle from Shape. Implement area() function for each derived class. 17. Write a program that reads two integers from the user and divides them, handling any exceptions that may occur (e.g., division by zero). 18. Write a program to read data from a text file, find the average, and write the result to another file.	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain proficiency in object-oriented programming principles and fundamental components of the C++ programming language.	U	PSO2

CO2	Comprehend classes, objects, access control, static members, constructors, destructors, operator overloading, type conversion, and anonymous objects.	An	PSO3
CO3	Apply inheritance concepts alongside memory management using new and delete operators	Ap	PSO5
CO4	Apply early and late binding, virtual and pure virtual functions, abstract classes, and exception handling using try, throw, and catch statements.	Ap	PSO4
CO5	Apply stream classes, file operations, file pointer manipulators, sequential input/output operations, and error handling techniques.	Ap	PSO5
CO6	Apply object-oriented programming principles in C++ through practical exercises and problem-solving tasks	Ap, C	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Object Oriented Programming with C++
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PSO2	U	C	L	
CO2	PO2, PSO3	An	C	L	
CO3	PO2,PO5, PSO5	Ap	P	L	
CO4	PO2, PSO4	Ap	P	L	
CO5	PO2,PO5, PSO5	Ap	P	L	
CO6	PO1, PO2,PO4, PSO4	Ap, C	M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	3	-	-	-	-
CO2	-	-	3	-	-	-
CO3	-	-	-	-	3	-
CO4	-	-	-	3	-	-

CO5	-	-	-	-	3	-
CO6	-	-	-	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-
CO3	-	2	-	-	1	-	-
CO4	-	2	-	-	-	-	-
CO5	-	2	-	-	1	-	-
CO6	3	3	-	1	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Discipline Specific Elective (DSE) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC300.1**				
Course Title	**MACHINE LEARNING FOR DATA SCIENCE**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	Develop skills to effectively handle real-world data challenges, enhance model performance optimization techniques, and apply machine learning algorithms adeptly across diverse data science applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Fundamentals of Machine Learning Development**		**9**	CO1
	1	Introduction to Machine Learning - Definition and types of Machine Learning - Machine Learning Development Lifecycle - Collecting and Manipulating data - Data Modeling, processing - Architecture to Model ML Apps in Production - Implementing Data Preprocessing.	9 hrs	
II	**Advanced Classification Techniques and Ensemble Methods**		**9**	CO2
	2	Introduction to Classification- Regularised Classification - Auto selection of parameters- Evaluation of best models- Model	9 hrs	

		representation - Lasso- Multi-task Lasso- Least – Angle Regression - Bayesian Regression- Robust regression models - Polynomial regression- Evaluation of best models- Model representation - Introduction to Random Forest- Auto selection of parameters - Bagging and Boosting Models- Model representation		
III	**Support Vector Machines and Dimensionality Reduction**		**9**	CO3
	3	Introduction to SVM – Auto selection of parameters – Evaluation of best models – Model representation - Linear and Quadratic Discriminant Analysis - Dimensionality reduction using Linear Discriminant Analysis - Mathematical formulation of the LDA and QDA classifiers - Support Vector Machines - Density estimation- novelty detection – Complexity - Mathematical formulation.	9 hrs	
IV	**Model Approaches and Implementations**		**9**	CO4
	4	Stochastic Gradient Descent, Naive Bayes, Decision Trees, Ensemble methods - mathematical formulation – implementation details - Nearest neighbours – classification, regression - nearest neighbour algorithms - out-of-core naive bayes model fitting	9 hrs	
V	**Flexi Module: Advanced Clustering and Feature Selection Techniques**		**9**	CO5
	5	Tree algorithms – Cart – Mathematical formulation – minimal cost- complexity pruning - forests of randomized trees - AdaBoost – gradient tree boosting - histogram-based gradient boosting - Feature selection - Multioutput regression, classification - Correlation Matrix with Heatmap - K-Means - Implement Hierarchical Clustering and evaluation – Euclidian dkatance.	9 hrs	

Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Müller and Sarah Guido, O'Reilly Media, Inc, 2016. 2. Essential Machine Learning and Pragmatic AI, By Noah Gift, December 2018. 3. Machine Learning Yearning by Andrew Ng, deeplearning.ai, 2018 4. Hands-On Unsupervised Learning Using Python, By Ankur A. Patel, March 2019 5. Clustering and Unsupervised Learning, By Angie Ma, Gary Willis and Alessandra Stagliano, August 2017

Lab Exercises	**30**	
1. Write a program to implement and compare SVM, KNN and Logistic regression algorithm to classify the iPhone purchase records data set. Print both correct and wrong predictions. Java/ Python ML library classes can be used for this problem. 2. Train a logistic regression model using scikit-learn and visualize the decision boundary. Compare the performance of different classification algorithms (e.g., decision trees, SVMs) on a simple synthetic dataset. **3.** Write a program to implement Logistic Regression algorithm to classify the housing price data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. **4.** Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test datasets. **5.** Assuming a set of documents that need to be classified, use the Naïve Bayesian Classifier model to perform this task Calculate the accuracy, precision, and recall for your data set. **6.** Construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. **7.** Implement the Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs. **8.** Implement k-Nearest Neighbour algorithm to classify the iris data set.	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Cultivate mastery in the foundational aspects of machine learning development, encompassing the execution of data preprocessing tailored for real-world scenarios.	Ap	PSO4, PSO5
CO2	Elevate skills in classification techniques, evaluating models, and applying ensemble methods for robust machine learning models.	An	PSO2, PSO3, PSO5
CO3	Acquire specialized knowledge in support vector machines, dimensionality contraction, and discriminant analysis to refine classification.	U	PSO2, PSO3
CO4	Comprehend and actualize a variety of machine learning paradigms for a spectrum of data science undertakings.	C	PSO1, PSO3, PSO4
CO5	Hone sophisticated competencies in clustering, attribute selection, and performance metrics for profound data investigation and interpretation.	E	PSO3, PSO5
CO6	Synthesize advanced machine learning algorithms and statistical models to analyze and predict patterns within diverse datasets	Ap, C	PSO3, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Machine Learning for Data Science
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO4, PSO5	Ap	P	L	
CO2	PO2, PO4, PO5, PSO2, PSO3, PSO5	An	C	L	

CO3	PO2, PO4, PO5, PO6, PSO2, PSO3	U	C	L	
CO4	PO4, PO5, PO6, PO7, PSO1, PSO3, PSO4	C	M	L	
CO5	PO4, PO6, PSO3, PSO5	E	P	L	
CO6	PO2, PO4, PO5, PO6, PSO3, PSO6	Ap, C	M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	-	-	3	3	-
CO 2	-	3	3	-	3	-
CO 3	-	3	3	-	-	-
CO 4	3	-	3	3	-	-
CO 5	-	-	3	-	3	-
CO 6	-	-	3	-	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	-	1	-	1	3	-	-
CO3	-	1	-	1	1	-	-
CO4	-	-	-	2	2	-	1-
CO5	-	-	-	1	-	-	-
CO6	-	1	-	1	1	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4				✓
CO 5		✓		
CO 6				✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC301.1**				
Course Title	**React and AJAX**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	1. HTML and CSS: Familiarity with HTML tags, elements, and attributes, as well as CSS for styling web pages. 2. JavaScript: Basic knowledge of JavaScript including variables, data types, functions, loops, and conditionals.				

	3. Basic Web Development Concepts: Understanding of basic web development concepts such as HTTP protocols, client-server communication, and RESTful APIs.
Course Summary	The React and AJAX course provides a comprehensive introduction to dynamic web development, focusing on creating interactive user interfaces using React.js and AJAX techniques. Students learn to make efficient API requests, handle loading states, and dynamically update content, enhancing their skills in web development.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to React, Components, Props, States**		**9**	CO1
	1	What is ReactJS? - Installation or Setup-Hello World with Stateless Functions - Absolute Basics of Creating Reusable Components - Create React App	2 hrs	
	2	Creating Components - Basic Component -Nesting Components - Props - Component states - Dynamic user-interface - Variations of Stateless Functional Components - setState pitfalls	2 hrs	
	3	ReactJS component written in TypeScript - Installation and Setup - Stateless React Components in TypeScript- Stateless and property-less Components	2 hrs	
	4	Basic State - Common Antipattern - setState() - State, Events And Managed Controls ,Props in React - Introduction - Default props - PropTypes- Passing down props using spread operator - Propschildren and component composition - Detecting the type of Children components	3 hrs	
II	**React Component Lifecycle , Forms and User Input , React Environments**		**9**	CO2
	5	Component Creation - Component Removal - Component Update - Lifecycle method call in different states - React Component Container	2 hrs	
	6	Controlled Components - Uncontrolled Components, ReactJS with jQuery, React Boilerplate, React Routing	2 hrs	
	7	Communication between Stateless Functional Components - Child to Parent Components - Not-related Components - Parent to Child Components , Stateless	2 hrs	

		Functional Component , Rendering components		
	8	Setting up React Environments - Simple React Component - Install all dependencies - Configure webpack -Configure babel - HTML file to use react component - Transpile and bundle your component , Basic Pane - Panel - Tab – PanelGroup	3 hrs	
III	**AJAX Fundamentals**		**9**	CO3
	9	Understanding Asynchronous JavaScript, Introduction to AJAX (Asynchronous JavaScript and XML), Making asynchronous requests with XMLHttpRequest	3 hrs	
	10	Introduction to Fetch API for modern AJAX requests, Handling responses using Promises	3 hrs	
	11	Error handling and handling loading states, Using Axios library for AJAX requests	3 hrs	
IV	**Integrating AJAX with React**		**9**	CO4
	12	Making AJAX requests in React components, Fetching data from an API using Fetch or Axios	3 hrs	
	13	Managing loading and error states in React components, Displaying fetched data in React components	3 hrs	
	14	Introduction to RESTful APIs, Authentication and Authorization with AJAX requests	3 hrs	
V	**Flexi Module: Advanced AJAX Techniques**		**9**	CO5
	15	Complex data structures (nested objects, arrays),Pagination and infinite scrolling, Optimistic UI updates for a smoother user experience	3 hrs	
	16	Debouncing and throttling for better performance, AJAX Polling and long polling for real-time updates	3 hrs	
	17	Caching AJAX responses for improved performance,Advanced error handling strategies in AJAX	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites,	**Books:** **1.** The Road To Learn React: Your Journey To Master Plain Yet Pragmatic React.Js , Robin Wieruch , 2024 Edition [Chapter 1- 8] 2. Ajax: The Complete Reference , Thomas A Powell,1st Edition [Chapter 9- 17] 3. Javascript: The Good Parts , Douglas Crockford [Chapter 9- 17] **Websites:** 1. https://books.goalkicker.com/ReactJSBook/ReactJSNotesForProfessionals.pdf 2. https://downloads.ctfassets.net/1x6ctgbxw6w0/68GD20EswgSysYUM		

	Tutorials	QCW88g/865ea65a41d02ae9f35965b7a37b221a/30-days-of-react-ebook-fullstackio.pdf		
Lab Exercises			**30**	
1. Set up a React development environment using Create React App. 2. Create a simple React component to display a greeting message. 3. Implement state management in a React component to toggle visibility or change text dynamically. 4. Build a todo list application with React, allowing users to add, delete, and mark tasks as completed. 5. Convert class components to functional components and vice versa in an existing React application. 6. Implement custom hooks for common functionalities like form validation or handling media queries. 7. Make a basic AJAX request using Fetch API to fetch data from a public API (e.g., JSONPlaceholder). 8. Implement loading and error states for AJAX requests in a React application. 9. Fetch data from an external API and display it dynamically in React components. 10. Build a CRUD (Create, Read, Update, Delete) application with AJAX requests to manage data.			30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Create interactive user interfaces with ease by showcasing their mastery of React.js foundations, such as components, props, state management, and lifecycle functions.	U	PSO2
CO2	Make AJAX requests to fetch data from external APIs and managing loading and error states.	U, Ap	PSO3, PSO4
CO3	Understand advanced React concepts such as hooks, context API, error boundaries, and server-side rendering, which will enable them to create scalable and maintainable React applications.	U,Ap	PSO3, PSO4
CO4	Integrate AJAX functionality into React applications for dynamic content updates and data fetching.	U, Ap	PSO4

CO5	Implement complex data structures, pagination, infinite scrolling, optimistic UI updates, debouncing, throttling, AJAX polling, long polling, caching AJAX responses, and advanced error handling strategies for enhanced web application performance and user experience.	C	PSO5
CO6	Build React applications, manage state, implement AJAX functionality, and integrate external APIs to create dynamic and interactive user interfaces.	C	PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: React and AJAX
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PSO2	U	P	L	
CO2	PO2, PO4, PO5, PSO3, PSO4	U, Ap	P	L	
CO3	PO1, PO2, PO4, PO5, PSO3, PSO4	U,Ap	C	L	
CO4	PO2, PO4, PO5, PSO4	U, Ap	P	L	
CO5	PO4, PO5, PSO5	C	P	L	
CO6	PO5, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	-	2	3	-	-
CO 3	-	-	3	3	-	-
CO 4	-	-	-	3	-	-
CO 5	-	-	-	-	3	-
CO6	-	-	-	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	-	-	-

CO2	-	3	-	2	1	-	-
CO3	3	1	-	1	2	-	-
CO4	-	1	-	2	1	-	-
CO5	-	-	-	1	2	-	-
CO6	-	-	-	-	1	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓			✓
CO 5		✓		
CO6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC302.1**				
Course Title	**BIG DATA ANALYTICS**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basics of Data Base, Data Structures, Data Science.				
Course Summary	Big data analytics course will help the learner to understand organisations harness their data and use it to identify new opportunities. This leads to smarter business moves, more efficient operations, higher profits and happier customers. Businesses that use big data with advanced analytics gain value in many ways most importantly in reducing cost.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
	Introduction to Big Data		**9**	
I	1	What is big data, why big data, Types of Digital Data-Characteristics of Data – Evolution of Big Data - Definition of Big Data - Challenges with Big Data - 3Vs of Big Data - Non Definitional traits of Big Data - Business Intelligence vs. Big Data convergence of key trends, unstructured data - Industry examples of big data, web analytics. Big data and marketing, fraud and big data, risk and big data, credit risk management - Big data and algorithmic trading. Big data and healthcare, big data in medicine, advertising and big data, big data	9 hrs	CO1

		technologies - Introduction to Hadoop, open source technologies, cloud and big data.		
II	**Data Modelling**		**9**	
	2	Introduction to streamed, structured and unstructured data, Storage of unstructured data - Introduction to NoSQL - Aggregate data models, aggregates, key-value and document data models, relationships - Graph databases, schema less databases, Materialized views, distribution models - Sharding, master-slave replication, peer-peer replication, sharding and replication - Consistency, relaxing consistency, version stamps - Map-reduce, partitioning and combining, composing map-reduce calculations.	9 hrs	CO2
III	**Hadoop Eco systems**		**9**	
	5	Hive – Architecture - data type - File format – HQL – SerDe - User defined functions. Pig: Features – Anatomy - Pig on Hadoop - Pig Philosophy - Pig Latin overview - Data types - Running pig - Execution modes of Pig. HDFS commands - Relational operators - Eval Functions - Complex data type - Piggy Bank. Parameter substitution - Diagnostic operator. Jasper Report: Introduction - Connecting to Mongo DB - Connecting to Cassandra. Connecting to Mongo DB - Connecting to Cassandra. Introduction to Machine learning: Linear Regression – Clustering - Collaborative filtering - Association rule mining - Decision tree.	9 hrs	CO3
IV	**Big Data Privacy**		**9**	
	7	ETHICS AND SECURITY Privacy – Re identification of Anonymous People – Why Big Data Privacy is self-regulating? - Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security.	9 hrs	CO4
V	**Flexi Module:**		**9**	

Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publication, 2015. 2. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Data Analytics Trends for Today's Businesses. Wiley ,2013 3. Tom White, "Hadoop: The Definitive Guide", O'Reilly Publications, 2012. 4. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", Joh Wiley & Sons, Inc., 2013. 5. Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012. 6. Russell Bradberry, Eric Blow, "Practical Cassandra A Developers Approach", Pearson Education, 2014

Lab Exercises	**30**	
1. Install, configure and run python, numPy and Pandas. 2. Install, configure and run Hadoop and HDFS. 3. Visualize data using basic plotting techniques in Python. 4. Create a NoSQL database schema for a social media application using a document data model. 5. Write a Hive query to analyze sales data and summarize total sales by region. 6. Develop a MapReduce program to find the grades of student's. 7. Develop a MapReduce program to implement Matrix Multiplication. 8. Implement word count / frequency programs using MapReduce. 9. Develop a MapReduce program to calculate the frequency of a given word in a given file. 10. Develop a program to calculate the maximum recorded temperature by yearwise for the weather dataset in Pig Latin.	30 hrs	CO6

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain a comprehensive understanding of Big Data, its significance, and the challenges it presents in various industries.	U	PSO2, PSO5

CO2	Learn about different data types and NoSQL databases, and will be able to implement data storage solutions for unstructured data.	Ap	PSO4, PSO5
CO3	Acquire practical skills in Hive, Pig, and Jasper Report, enabling them to process and analyze Big Data effectively.	An, C	PSO3, PSO4
CO4	Understand the ethical implications and security measures necessary to protect privacy and integrity in Big Data analytics.	E	PSO1, PSO5
CO5	Set up key Big Data tools, analyze large datasets, and gain insights using advanced data processing techniques.	R, Ap, An, C	PSO3, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Big Data Analytics
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO4, PO5, PSO2, PSO5	U	C	L	
CO2	PO1, PO2, PO5, PSO4, PSO5	Ap	P	L	
CO3	PO2, PO5, PO6, PSO3, PSO4	An, C	P, C	L	
CO4	PO1, PO5, PSO1, PSO5	E	C, M	L	
CO5	PO2, PO4, PSO3, PSO6	R, Ap, An, C	F, P, C, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	3	2	2	3	2
CO 2	1	2	3	3	3	2

CO 3	1	2	3	3	2	3
CO 4	3	1	1	1	2	1
CO 5	2	3	3	3	3	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	1	-	-
CO2	2	1	-	-	1	-	-
CO3	-	3	-	-	3	-	-
CO4	2	-	-	-	1	-	-
CO5	-	1	-	-	-	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	-	-	✓
CO 2	✓	-	-	✓
CO 3	✓	✓	-	✓
CO 4		✓	-	✓
CO 5	✓		-	✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC303.1**				
Course Title	**ML PIPELINE AND MODEL MANAGEMENT**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Prior exposure to machine learning concepts is beneficial. Basic knowledge of programming concepts (preferably Python).				
Course Summary	Equips students with essential skills in machine learning pipeline development, encompassing data preprocessing, model selection, deployment, and governance, fostering proficiency in applying theoretical concepts to practical scenarios for effective machine learning solutions.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Machine Learning Pipeline**		**9**	CO1
	1	Basics of ML Pipeline: Data preprocessing - Model selection techniques - Model training and evaluation. Data Preprocessing: Handling missing data - Outlier detection and removal - Feature scaling and normalization - Model Selection: Types of machine learning algorithms - Cross-validation techniques - Model evaluation metrics.	9 hrs	
II	**Data Preprocessing and Feature Engineering**		**9**	CO2
	2	Data Cleaning: Handling missing values - Dealing with outliers - Data imputation techniques. Feature Engineering: Feature	9 hrs	

		extraction methods - Feature selection techniques - Encoding categorical variables.		
III	**Model Selection and Hyperparameter Tuning**		**9**	CO3
	3	Model Selection: Classification vs. Regression - Decision trees vs. Neural networks - Ensemble methods. Hyperparameter Tuning: Grid search - Random search - Hyperparameter optimization techniques.	9 hrs	
IV	**Model Deployment and Monitoring**		**9**	CO4
	4	Model Deployment: Deployment strategies (batch, real-time) - Containerization (e.g., Docker) - Serving models through APIs. Model Monitoring: Monitoring model performance - Detecting data drift - Ensuring model reliability.	9 hrs	
V	**Flexi Module: Model Governance and Ethical Considerations**		**9**	CO5
	5	Model Governance: Regulatory compliance - Model documentation - Model versioning and tracking. Ethical Considerations: Fairness and bias in ML models - Transparency and interpretability - Privacy protection and data ethics.	9 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Building Machine Learning Powered Applications: Going from Idea to Product" by Emmanuel Ameisen, O'Reilly Media,2018. 2. Feature Engineering for Machine Learning: Principles and Techniques for Data Scientists by Alice Zheng and Amanda Casari, O'Reilly Media, 2018 3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurélien Géron, 2019. 4. The Ethical Algorithm: The Science of Socially Aware Algorithm Design, Michael Kearns and Aaron Roth, 2020. 5. Python Machine Learning, Sebastian Raschka and Vahid Mirjalili, Packt Publishing, 2015 (Lab exercises) **Websites:** • Scikit-learn Documentation • Pandas Documentation		

		Tutorials: Kaggle Tutorials (Lab exercises)		
Lab Exercises			**30**	
Tools: Jupyter Notebook, Anaconda (1 – 9) **Libraries: Scikit-learn, Pandas, NumPy, Matplotlib, Seaborn (1,2,3)** 1. Implement data preprocessing techniques such as handling missing values and scaling features on a given dataset. 2. Explore different machine learning algorithms and compare their performance on a classification task using cross-validation. 3. Develop a machine learning pipeline that includes data preprocessing, model selection, training, and evaluation stages. **Libraries:** Scikit-learn, Pandas, NumPy (4,5,6) 4. Clean a dataset by removing outliers and imputing missing values using appropriate techniques. 5. Perform feature extraction from raw data using methods such as PCA or LDA and visualize the extracted features. 6. Apply feature selection techniques to identify the most relevant features for a given prediction task. **Libraries:** Scikit-learn, GridSearchCV (from Scikit-learn), RandomizedSearchCV (from Scikit-learn) (7,8,9) 7. Implement grid search and random search for hyperparameter tuning on a machine learning model. 8. Compare the performance of different machine learning algorithms using cross-validation and select the best-performing model. 9. Develop an ensemble model by combining multiple base classifiers and evaluate its performance on a classification task. **Tools**: Docker (10-12) **Libraries**: Flask (for creating APIs), Scikit-learn, Pandas 10. Containerize a trained machine learning model using Docker and create a RESTful API for serving predictions. 11. Implement a batch processing strategy for model deployment and monitor the model's performance over time. 12. Detect data drift by comparing the distribution of incoming data with the training data and take appropriate actions to maintain model reliability. **Tools**: Git (for version control) **Libraries**: Scikit-learn, Pandas 13. Document the entire machine learning pipeline, including data preprocessing, model training, and deployment steps.			30 hrs	CO6

14. Version control the machine learning model code and track changes made to the model over time. 15. Evaluate the fairness and bias of a trained model using appropriate metrics and propose strategies to mitigate any identified biases.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain an understanding of the key stages and components of a machine learning pipeline, from data preprocessing to model training and evaluation.	U	PSO1, PSO3
CO2	Develop proficiency in data preprocessing techniques and feature engineering methods to prepare datasets for machine learning models effectively.	Ap	PSO3, PSO6
CO3	Acquire the ability to select appropriate machine learning models and optimize their hyperparameters to achieve optimal performance on given tasks.	Ap	PSO3, PSO6
CO4	Learn how to deploy machine learning models into production environments and monitor their performance to ensure reliability and effectiveness.	Ap	PSO2, PSO4
CO5	Understand the importance of model governance and ethical considerations in machine learning applications, including regulatory compliance and bias mitigation.	U	PSO1, PSO5
CO6	Develop practical skills in implementing end-to-end machine learning pipelines, from data preprocessing and model selection to deployment and monitoring, fostering the ability to apply theoretical concepts to real-world scenarios effectively.	Ap	PSO3, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: ML Pipeline and Model Management
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO1, PSO3	U	C	L	
CO2	PO1, PO5, PSO3, PSO6	Ap	P	L	
CO3	PO1, PO2, PSO3, PSO6	Ap	P	L	
CO4	PO2, PO5, PSO2, PSO4	Ap	P	L	
CO5	PO1, PO5, PSO1, PSO5	U	C	L	
CO6	PO2, PO5, PSO3, PSO6	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	-	3	-	1	3
CO 2	-	-	3	-	-	3
CO 3	-	-	3	-	-	3
CO 4	-	2	-	2	-	-
CO 5	1	-	-	-	3	-
CO 6	-	-	3	-	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	-	-
CO2	2	-	-	-	1	-	-
CO3	1	1	-	-	-	-	-
CO4	-	3	-	-	3	-	-
CO5	3	-	-	-	3	-	-
CO6	-	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low

2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC304.1**				
Course Title	**WEB SERVER ADMINISTRATION**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of networking concepts and familiarity with Linux or Windows operating systems is recommended.				

Course Summary	This course covers the fundamental principles and practices of administering web servers. Students learn how to install, configure, and maintain web server software. Students gain understanding on how to manage web servers effectively in various environments.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Commands**		**9**	CO1
	1	Basic Linux commands	9 hrs	
	2	Basic Windows server commands		
II	**Basic Web server hardware requirements**		**9**	CO2
	3	Install and configure a Web server - Apache Internet information server	9 hrs	
III	**Configure the Domain Name server**		**9**	CO3
	4	Manage Web server tasks: User authentication, Setup users and groups, Manage file system permissions, Share resources (such as folders for web publishing) , Secure a Web server	9 hrs	
IV	**Configuration of multiple Web sites on a Web server**		**9**	CO4
	5	Configuration of multiple Web sites on a Web server	9 hrs	
V	**Flexi Module: Configuration and support of e-mail services**		**9**	CO5
	6	Configuration and support of e-mail services	9 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Charles Aulds, Linux Apache Web Server Administration, Wiley 2. Web Server Administration by Steve Silva **Websites:** 1. https://www.digitalocean.com/community/conceptual-articles/introduction-to-web-servers		
Lab Exercises			**30**	CO6
1. Basic Linux commands: • Use the terminal to navigate the file system, create directories, and list files. • Practice using commands like ls, cd, mkdir, rm, cp, mv, grep, and chmod.			30 hrs	

- Write a shell script to automate a simple task, such as backing up files or renaming multiple files.

2. Basic Windows server commands:
   - Explore Windows PowerShell commands for managing files, directories, and processes.
   - Use dir, cd, mkdir, del, copy, and tasklist commands to perform basic tasks.
   - Practice using PowerShell cmdlets to manage users, groups, and permissions.
3. Basic Web server hardware requirements:
   - Research and document the hardware specifications needed to set up a basic web server.
   - Use online resources or tools to calculate the required CPU, RAM, storage, and network bandwidth for hosting a website.
4. Install and configure a Web server - Apache:
   - Install the Apache web server using package manager on Linux (e.g., apt-get or yum) or download and install it manually on Windows.
   - Configure Apache to serve a basic HTML webpage.
   - Explore the Apache configuration file to customize settings such as document root, virtual hosts, and logging.
5. Internet Information Server (IIS):
   - Install and configure IIS on a Windows Server machine.
   - Create a simple website using IIS Manager.
   - Configure IIS features such as authentication, logging, and MIME types.
6. Configure the Domain Name Server:
   - Set up a DNS server using BIND on a Linux machine.
   - Configure DNS zones, records, and forwarders.
   - Test DNS resolution using nslookup or dig commands.
7. Manage Web server tasks:
   - Implement user authentication on Apache using .htpasswd files.
   - Create user accounts and groups on a Linux server and grant them access to web directories.
   - Configure file system permissions to restrict access to sensitive files.
   - Set up shared folders for web publishing and test file sharing across the network.
8. Configuration of multiple Web sites on a Web server:
   - Configure virtual hosts in Apache to host multiple websites on the same server.

• Set up separate directories and domain names for each virtual host. • Test access to each website by configuring hosts file or using DNS. 9. Configuration and support of e-mail services: • Set up a mail server using Postfix and Dovecot on a Linux machine. • Configure mailboxes, aliases, and forwarding rules. • Test sending and receiving emails using a mail client like Thunderbird or Outlook.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand basic Linux and Windows server commands.	U	PSO-2
CO2	Understand and analyse the proficiency in installing and configuring web server software.	U, A	PSO-2,3
CO3	Create awareness on how to Configure the Domain Name server - Manage Web server tasks	U, A, C	PSO-2,3
CO4	Understand the configuration of multiple Web sites on a Web server.	U	PSO-2,3,5
CO5	Understand the Configuration and support of e-mail services	U	PSO-2,3,5
CO6	Apply basic server administration and web hosting concepts to configure and manage Linux and Windows servers, set up DNS, implement user authentication, and manage email services	Ap	PSO-2,3,5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Web Server Administration
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO-2	U	P	L	

CO2	PO1, PO2, PO5, PSO-2,3	U, A	P	L	
CO3	PO2, PO5, PSO-2,3	U, A, C	P	L	
CO4	PO2, PO5, PSO-2,3,5	U	P	L	
CO5	PO2, PO5, PSO-2,3,5	U	P	L	
CO6	PO2, PO5, PSO-2,3,5	Ap	M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	-	-	-	-	-
CO2	2	3	-	-	-	-
CO3	-	-	1	-	-	-
CO4	-	-	2	3	-	-
CO5	-	1	-	-	-	-
CO6	-	-	-	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-
CO2	2	2	-	-	3	-	-
CO3	-	1	-	-	3	-	-
CO4	-	2	-	-	3	-	-
CO5	-	1	-	-	3	-	-
CO6	-	1	-	-	2	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6				

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK5DSECSC305.1**				
Course Title	**BLOCK CHAIN TECHNOLOGY**				
Type of Course	**DSE**				
Semester	**V**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge in Cryptography, Distributed systems, Networking, Mathematics and Algorithms.				
Course Summary	This course is a comprehensive program designed for participants seeking to deepen their understanding and proficiency in blockchain technology.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Fundamentals of Blockchain technology**		**12**	CO1
	1	Fundamentals of Blockchain technology: blockchain and Bitcoin - Generic elements of a blockchain - Types of blockchain – Decentralization - Platforms for decentralization - Concept of Distributed Ledger - Cryptographic primitives - Symmetric -Cryptography - Data Encryption Standard - Advanced Encryption Standard - Block Ciphers - Hash Functions (SHA) - Digital Signatures - Public-Key Cryptography (RSA, ECDSA). Distributed Systems - Basic principle design – architecture - Inter-process communication - peer-to-peer networks.	12 hrs	
II	**Bitcoin**		**12**	
	2	Bitcoin - Digital keys and addresses – Transactions – Blockchain - structure of a block - structure of block header - genesis block – Mining - Tasks of the miners - Mining rewards – PoW - Mining algorithms - hash rate - mining systems - Bitcoin Network and Payments – Wallets - Innovation in Bitcoin - Bitcoin Clients and APIs - Alternative Coins - Bitcoin limitations	12 hrs	CO2
III	**Ethereum Architecture**		**12**	
	3	Smart Contracts - Ricardian contracts Ethereum – Architecture - yellow paper - components of Ethereum ecosystem - transactions and messages - Ether cryptocurrency - Ether Virtual Machine (EVM) - Further Ethereum - Programming languages - runtime bytecode - genesis	12 hrs	CO3

		block - fess schedule – APIs - Tools and DApps.		
IV	**Ethereum Development Environment**		**12**	
	4	Ethereum Development Environment - Development Tools and Frameworks – Truffle - Web 3 - POST requests – Truffle - Hyperledger as a protocol – Fabric - Sawtooth Lake – Corda - alternative blockchains - Current landscape and emerging trends.	12 hrs	CO4
V	**Flexi Module:**		**12**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. I. Bashir, Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts, DApps, cryptocurrencies, Ethereum, and more, Third Edition, Packt Publishing Limited 2020 2. D. Tapscott and A. Tapscott, Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World, Portfolio Penguin, 2018. 3. A. M. Antonopoulos and G. Wood, Mastering Ethereum: Building Smart Contracts and DApps, O′Reilly 2018. **Website:** 1. S. Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, 2009, Available Online: https://bitcoin.org/bitcoin.pdf. 2. A. Lewis, The Basics of Bitcoins and Blockchains: An Introduction to Cryptocurrencies and the Technology that Powers Them (Cryptography, Crypto Trading, Digital Assets, NFT), Mango Media, 2018.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamentals of blockchain technology, including its components, types, decentralization, cryptographic primitives, distributed ledger concept, and basic principles of distributed systems.	U	PSO2

CO2	Understand Bitcoin, covering digital keys, transactions, blockchain structure, mining, rewards, proof-of-work, network and payments, wallets, innovation, clients, APIs, alternative coins, and limitations.	U	PSO4
CO3	Understand Ethereum architecture, including smart contracts, Ricardian contracts, the Ethereum ecosystem, Ether cryptocurrency, Ether Virtual Machine (EVM), APIs, and tools and DApps	U	PSO1
CO4	Euipped with the knowledge of Ethereum development environments, and alternative blockchains like Hyperledger Fabric, Sawtooth Lake, and Corda.	U	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Block Chain Technology
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2	U	F, C	L	
CO2	PO1, PO2, PO5, PSO4	U	P	L	
CO3	PO1, PO2, PO5, PSO1	U	F, C	L	
CO4	PO1, PO5, PSO4	U	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	3	-	-	-	-
CO2		-	-	3	-	-
CO3	3	-	-	-	-	-
CO4	-	-	-	3	-	=

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-

CO2	2	2	-	-	3	-	-
CO3	2	1	-	-	3	-	-
CO4	3	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓	✓		✓
CO4	✓	✓		✓

Skill Enhancement Course (SEC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**
Course Code	**MIUK4SECCSC250.1**
Course Title	**MULTIMEDIA AND ANIMATION TECHNOLOGY**
Type of Course	**SEC**
Semester	**V**
Academic Level	**3**

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	A foundation in creative thinking and artistic skills can be beneficial for animation and multimedia design courses.				
Course Summary	This program is crafted to acquaint participants with subjects pertaining to the generation, design, and incorporation of diverse media components. Multimedia involves employing various types of media, including text, graphics, audio, video, and interactive elements, to communicate information or enhance user experiences. The curriculum delves into different multimedia contents and their significance in today's digital world.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Multimedia**	**6**	CO1
	1	Multimedia: Media and Data Stream, Main properties of a Multimedia System	2 hrs	
	2	Multimedia Building Blocks: Text, Audio, Image, Animation,Video. Multimedia Image and Graphics: Resolution,Size and Compression, File formats, Multimedia Hardware	4 hrs	
II		**Compression and Image Editing**	**6**	CO2
	3	Data Compression,Storage Media, Multimedia Communication Systems, Networking Systems,	2 hrs	
	4	Image editing tool interface: Customizing Workspaces,File Handling,Setting Size and resolution prarameters,Importing files	2 hrs	
	5	Image editing techniques: Adjusting exposure,colour.Cropping and adjusting aspect ratio,Sharpening and noise reduction	2 hrs	
III		**Basics of Animation**	**6**	CO3
	6	Basics of Animation: Exploring User Interface, Installation and Configuration , Know about Editors,Scenes and Objects.	3 hrs	

	7	Fundamentals of Animation: Types of Animation, Keyframes, Timelines, Graph Editor, Dope Sheet.	3 hrs	
IV	**3D Animation**		**6**	CO4
	8	3D Animation: Creating/ Importing Object	2 hrs	
	9	Texturing, Lightining and Rendering, Dynamics	2 hrs	
	10	Animation,Adding sound effects, Saving and Exporting	2 hrs	
V	**Flexi Module: Immersive Technologies: VR, AR, and MR Principles and Applications**		**6**	CO5
	11	Understanding the principles of VR, AR, and MR.	2 hrs	
	12	Exploring development platforms and tools, creating immersive environments.	2 hrs	
	13	Integrating interactive elements, and designing compelling narratives for immersive storytelling.	2 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Multimedia Computing,Communications and Applications By Ralf Steinmetz, Klara Nahrstedt.[Module1] 2. The Illusion of Life / Frank Thomas and Ollie Johnston[Module 2] 3. The Animator's Survival Kit / Richard Williams[Module 3 ,4] 4. Immersive Multimedia and Animation: A Practical Guide Author: Dr. Emily Johnson Edition: 1st Edition[Module 5]		
Lab Exercises			**30**	CO6
1. Data Compression and Storage Media: • Research and compare different data compression algorithms. • Experiment with compressing various types of multimedia data (text, audio, images, videos) using popular compression techniques. • Explore different storage media options (hard drives, SSDs, optical discs) and their suitability for storing multimedia content based on factors like capacity, speed, and durability. • Multimedia Communication Systems and Networking Systems: • Study various multimedia communication protocols (e.g., HTTP, RTP) and their roles in transmitting multimedia data over networks.			30 hrs	

- Set up a small-scale multimedia communication system using networked devices (e.g., computers, smartphones, tablets) to transfer different types of media.
- Investigate network bandwidth requirements for streaming multimedia content in real-time and propose strategies for optimizing network performance.

2. Image Editing Tool Interface:

- Learn how to customize workspaces in popular image editing software (e.g., Adobe Photoshop, GIMP).
- Practice file handling techniques, including opening, saving, and exporting images in different file formats.
- Experiment with setting size and resolution parameters for images and understand their impact on file size and quality.
- Explore importing files from various sources (e.g., digital cameras, scanners, stock image libraries) into image editing software.

3. Image Editing Techniques:

- Master basic image adjustment techniques such as exposure, color correction, and contrast enhancement.
- Practice cropping images and adjusting aspect ratios to achieve desired compositions.
- Experiment with sharpening and noise reduction filters to enhance image clarity and reduce unwanted artifacts.

4. Basics of Animation:

- Install and configure animation software (e.g., Adobe Animate, Blender).
- Familiarize yourself with the user interface and navigation tools within the animation software.
- Learn about creating and organizing scenes and objects in animation projects.

5. Fundamentals of Animation:

- Explore different types of animation (e.g., traditional, 2D digital, 3D).
- Understand the concept of keyframes and how they are used to define motion in animations.
- Study timelines, graph editors, and dope sheets for controlling animation sequences and timing.

6. 3D Animation:

- Practice creating and importing 3D objects into animation software.
- Experiment with texturing techniques to add realistic surface materials to 3D models.

• Learn about lighting and rendering techniques to enhance the visual quality of 3D scenes. • Explore dynamics simulations for creating realistic physics-based animations. • Add sound effects to animations and practice saving and exporting finished projects in various formats.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the basic building blocks and properties of Multimedia Components.	U	PSO3
CO2	Analyse the working of Data Compression and Image editing tools and techniques	An	PSO4
CO3	Understand Basics of Animations	U	PSO3
CO4	Analyze 3D Animation techniques	An	PSO4
CO5	Understand immersive technologies in multimedia and animation.	U	PSO4
CO6	Gain proficiency in multimedia technologies through research, experimentation, and practical exercises	Ap	PSO3, PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Multimedia and Animation Technology
Credits: 2:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO3	U	C	L	
CO2	PO1, PO2, PO5, PSO4	An	P	L	
CO3	PO1, PO2, PSO3	U	C	L	

CO4	PO1, PO5, PSO4	An	P	L	
CO5	PO1, PO5, PSO4	U	C	L	
CO6	PO1, PO5, PO6, PSO3, PSO4	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	-	3	-	-	-
CO 2	-	-	-	3	-	-
CO 3	-	-	-	-	-	-
CO 4	-	-	3	3	-	-
CO 5	-	-	-	3	3	-
CO 6	-	-	3	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	-	-
CO2	2	2	-	-	2	-	-
CO3	2	1	-	-	-	-	-
CO4	2	-	-	-	1	-	-
CO5	1	-	-	-	1	-	-
CO6	1	-	-	-	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments

- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Semester VI

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSCCSC350.1**				
Course Title	**THE ESSENTIALS OF OPERATING SYSTEMS**				
Type of Course	**DSC**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	1. Basic computer literacy 2. Basic Knowledge about with computer architecture and organization. 3. May heard about the working interfaces of computers. 4. Knowledge about data structures and algorithms 5. Knowledge about mathematics and problem-solving skill				
Course Summary	This course is designed to provide participants with fundamental concepts about the operating system. The participants can learn the proper working of operating system. The concepts include the structure of various operating systems, functioning and algorithm. The curriculum makes the participants to attain confidence and competence in implementing different operating system and design.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Operating System**		**12**	CO1
	1	Definition, Operating System's role, Operations, Functions,	3 hrs	

	2	**Operating-System Structures:** Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls.	3 hrs	
	3	**Processes:** Process Concept, States, PCB, Operations on Processes, Inter-process Communication.	3 hrs	
	4	**Threads:** Overview, Multicore Programming, Multithreading Models.	3 hrs	
II	**CPU Scheduling**		**12**	CO2
	5	Basic Concepts, Scheduling Criteria,	2 hrs	
	6	Scheduling Algorithms - FCFS, SJF, SRTF, Priority, RR	6 hrs	
	7	Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling	2 hrs	
	8	Thread Scheduling	2 hrs	
III	**Process Synchronization and Deadlock**		**12**	CO3
	9	General structure of a typical process, Race condition	2 hrs	
	10	The Critical-Section Problem, Peterson's Solution	3 hrs	
	11	Synchronization Hardware, Mutex Locks	2 hrs	
	12	Semaphores, Classic Problems of Synchronization, Monitors	2 hrs	
	13	Deadlocks - System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	3 hrs	
IV	**Memory Management**		**12**	CO4
	14	**Main Memory:** Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table	2 hrs	
	15	**Virtual Memory:** Background, Demand Paging, Copy-on-Write	3 hrs	
	16	Page Replacement - Basic Page Replacement, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement, Allocation of Frames, Thrashing.	3 hrs	
	17	**Mass-Storage Structure:** Overview, Disk Structure, Disk Scheduling	2 hrs	
	18	**File-System Interface:** File Concept, Access Methods, Directory and Disk Structure, File-System Structure, Free-Space Management	2 hrs	

V	**Flexi Module: Concepts of modern operating system**		**12**	CO5
	19	Concurrency Control techniques	3 hrs	
	20	Security control, Virtualization, Containerization	6 hrs	
	21	Distributed Systems	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, "Operating System Concepts", Wiley India Pvt. Ltd 2018, 9th Edition. 2. Achyut S Godbole and Atul Kahate - Operating systems, McGraw hill 3. Andrew S. Tanenbaum, Herbert Bos, "Modern Operating Systems", Pearson 2014, 4th Edition. 4. William Stallings, "Operating Systems Internals and Design Principles", Pearson, 2018, 9th Edition. **Websites:** 1. https://www.tutorialspoint.com/operating_system/index.htm 2. https://www.geeksforgeeks.org/operating-systems/ 3. https://baou.edu.in/assets/pdf/PGDCA104_slm.pdf 4. https://www.vssut.ac.in/lecture_notes/lecture1423726024.pdf		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Acquire knowledge about the basic concepts of operating system	R, U	PSO2
CO2	Illustrate the concepts of scheduling.	R, U	PSO2
CO3	Learning the concepts of deadlock conditions.	R, U	PSO2
CO4	Obtain the concepts of memory management techniques	R, U	PSO2
CO5	Obtain modern operating system concepts	U	PSO2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: The Essentials of Operating Systems
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2	U	F, C	L	
CO2	PO1, PO5, PSO2	U	F, C	L	
CO3	PO1, PO5, PSO2	U	F, C	L	
CO4	PO1, PO2, PO5, PSO2	U	F, C	L	
CO5	PO2, PO5, PSO2	U	F, C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	3	-	-	-	-
CO 3	-	3	-	-	-	-
CO 4	-	3	-	-	-	-
CO 5	-	3	-	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	2	-	-	-	2	-	-
CO3	1	-	-	-	3	-	-
CO4	1	1	-	-	3	-	-
CO5	-	2	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSCCSC351.1**				
Course Title	**INTERNET OF THINGS**				
Type of Course	**DSC**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basics of computer networks				
Course Summary	Provides a comprehensive exploration of IoT, covering its evolution, architecture, protocols, edge computing, smart devices, machine learning applications, and real-world case studies in various sectors.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Exploring the IoT Landscape**		**12**	CO1
	1	Emergence of IoT - Evolution and significance of IoT – Definition & Characteristics of IoT - IoT and Big Data - IoT and Cloud Computing, IoT and Industry 5.0 - Architectures and Reference Models of IoT: IoTWF Reference Model of IoT - IoT Applications in Vertical Market: - Smart Agriculture, Smart Grid, Smart Building, Smart Factory, Smart City.	12 hrs	
II	**IoT Protocols and Software**		**12**	CO2
	2	MQTT, UDP - MQTT brokers, publish subscribe modes - HTTP, AMQP – COAP - IoT point to point communication technologies: IoT Communication Pattern - IoT protocol Architecture - Selection of Wireless technologies: 6LoWPAN, Zigbee, WIFI, LORA, Lifi, Widi.	12 hrs	
III	**Tracing Evolution to Edge Computing**		**12**	CO3
	3	Evolution of Cloud Computation - Commercial clouds and their features - open source IoT platforms, cloud dashboards - Fog computing: Need for Fog computation - Fog applications - Edge computing: Need for edge computation - Edge computing architectures - Edge Applications.	12 hrs	
IV	**The Smart "Things" in IoT**		**12**	CO4
	4	Definition and Architecture of Smart Things – Sensors – Actuators - Electrical Motors - IoT Frameworks and Platforms: FIWARE, SmartThings, AWS IoT - Microsoft Azure IoT - Azure Stream Analytics - Azure Machine Learning - Data Access and Distributed Processing for IoT: TXT format - CSV format, XLSX format - Working with the JSON format, HDF5 format.	12 hrs	
V	**Flexi Module:** **Machine Learning for IoT: ML and IoT**		**12**	CO5

	5	Prediction using linear regression, Logistic regression for classification - Deep Learning for IoT - Generative Models for IoT - Personal and Home IoT: IoT and smart homes.- Smart lighting. Microcontrollers for IoT: Introduction to Arduino, ESP8266 Node MCU, Arduino IDE, Raspberry pico.	7 hrs	
	6	Introduction and Case Studies:Agricultural IoT - Vehicular IoT – Healthcare IoT - IoT Analytics	5 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Internet of Things: Architectures, Protocols and Standards, Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, 2019 Wiley. 2. Intelligent Internet of Things From Device to Fog and Cloud, Farshad Firouzi, Krishnendu Chakrabarty Sani Nassif, Springer. 3. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Grasp IoT Fundamentals: Definitions, Architectures, Hurdles, and Potentials.	U	PSO1, PSO5
CO2	Possess comprehensive knowledge of IoT communication protocols and wireless technologies.	An	PSO2, PSO5
CO3	Understand cloud, fog, and edge computing concepts and their practical applications in IoT.	U, Ap	PSO3, PSO5
CO4	Decipher Smart Things: Understanding Sensors, Actuators, and IoT Frameworks for Data Access and Processing.	Ap	PSO4, PSO5
CO5	Adeptly apply predictive analytics, deep learning, and generative models in IoT.	E, C	PSO3, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Internet of Things
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO1, PSO5	U	C	L	
CO2	PO1, PO5, PSO2, PSO5	An	P	L	
CO3	PO1, PO5, PSO3, PSO5	U, Ap	C	L	
CO4	PO1, PO2, PO5, PSO4, PSO5	Ap	P	L	
CO5	PO2, PO5, PSO3, PSO6	E, C	MU	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1				3	
CO 2		3			3	
CO 3			3		3	
CO 4				3	3	
CO 5			3			3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	2	-	-	-	2	-	-
CO3	1	-	-	-	3	-	-
CO4	1	1	-	-	3	-	-
CO5	-	2	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low

2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4				✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSCCSC352.1**				
Course Title	**OBJECT ORIENTED PROGRAMMING WITH JAVA**				
Type of Course	**DSC**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	A basic understanding of programming concepts such as variables, data types, control structures, and methods is essential.				
Course Summary	This course is designed to introduce students to the principles and practices of object-oriented programming using the Java programming				

	language. Participants will learn to design, implement, and test object-oriented software, with a focus on encapsulation, inheritance, polymorphism, and abstraction. The course combines theoretical concepts with hands-on programming exercises to provide a solid foundation in object-oriented design and Java programming. Students will learn the basics of Java syntax, object-oriented programming (OOP) principles, and how to design and implement Java applications.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction**		**9**	CO1
	1	Object Oriented Programming: Object Oriented paradigm, Basic concepts of Object Oriented Programming.	4 hrs	
	2	Introduction to Java: Java Features, Your First Program, Data Types, Declaring Variables, Operators, Input in Java: The Scanner Class. Control structures, Arrays.	5 hrs	
II	**Classes, Objects and Inheritance**		**9**	CO2
	3	Defining a class, Fields declaration, Methods declaration, Creating objects, Accessing class members, Constructors, Method overloading, Static members	4 hrs	
	4	Inheritance: Defining Inheritance, Implementing Inheritance in Java, Method Overriding, Abstract Classes, Abstract Methods, The final Modifier, Interfaces.	5 hrs	
III	**Packages and Multithreaded Programming**		**9**	CO3
	5	Packages: Java API packages, Using system packages, Creating packages, Accessing a package, Using a package, Adding a class to a package	4 hrs	
	6	Multithreaded Programming: Creating threads, Extending the Thread class, Life cycle of a thread, Synchronization, Implementing the Runnable interface, Inter-thread Communication.	5 hrs	
IV	**Exception Handling and JavaFX**		**9**	CO4
	7	Exception Handling: Exceptions, Syntax of exception handling, Multiple catch statements, Using finally statement, Throwing our own exceptions.	4 hrs	

	8	Introducing GUI programming with JavaFX: JavaFX basic concepts, A JavaFX application skeleton, Compiling and running a JavaFX program, JavaFx controls – Label, Button, RadioButton, CheckBox, ListView, ComboBox, TextField, ScrollPane. Event handling.	5 hrs	
V		**Flexi Module:**	**9**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. E. Balaguruswamy, Programming with JAVA, A primer, 3e, TATA McGrawHill Company 2. Java: The Complete Reference, Herbert Schildt, Tata McGraw Hill Edition, Ninth Edition **Websites:** 1. https://docs.oracle.com/javase/tutorial/		
Lab Exercises			**30**	
1. Develop a Java program that displays "Hello, World!" in the console. 2. Write a Java program to read user input and ensure its validity. 3. Demonstrate encapsulation through methods in a Java program. 4. Illustrate classes and objects in a Java program. 5. Showcase the usage of static methods in a Java program. 6. Implement inheritance in a Java program. 7. Demonstrate method overriding in a Java program. 8. Illustrate interface implementation in a Java program. 9. Create a program to implement a Java package. 10. Design a simple thread in a Java program. 11. Demonstrate exception handling by dealing with arithmetic exceptions in a Java program. 12. Create a JavaFX application.			30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Attain expertise in grasping and utilizing the fundamental principles of Object-Oriented Programming and Java programming	Ap	PSO2, PSO4, PSO5

CO2	Define classes, implement inheritance, and utilize advanced features such as method overriding, abstract classes, and interfaces.	Ap	PSO2, PSO4, PSO5
CO3	Utilize Java packages effectively and implement multithreaded programming concepts.	Ap	PSO2, PSO3, PSO4, PSO5
CO4	Manage exceptions in Java and develop graphical user interfaces using JavaFX.	Ap	PSO2, PSO3, PSO4, PSO5
CO5	Demonstrate proficiency in understanding and applying fundamental OOP concepts as well as practical skills in Java programming.	Ap	PSO2, PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Object Oriented Programming with Java
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2, PSO4, PSO5	Ap	p	L	
CO2	PO1, PO2, PO5, PSO2, PSO4, PSO5	Ap	P	L	
CO3	PO1, PO5, PSO2, PSO3, PSO4, PSO5	Ap	p	L	
CO4	PO1, PO2, PO5, PSO2, PSO3, PSO4, PSO5	An	P	L	
CO5	PO1, PO5, PSO2, PSO3, PSO4, PSO5	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	-	3	3	-
CO 2	-	3	-	3	3	-
CO 3	-	3	3	3	3	-

CO 4	-	3	3	3	3	-
CO 5	-	3	3	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	3	-	-
CO2	2	1	-	-	2	-	-
CO3	3	-	-	-	2	-	-
CO4	3	1	-	-	1	-	-
CO5	1	-	-	-	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓			✓

Discipline Specific Elective (DSE) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC350.1**				
Course Title	**DEEP LEARNING**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of machine learning concepts, and familiarity with programming languages such as Python.				
Course Summary	Acquire expertise in all aspects of deep learning, including fundamental theories, workflow strategies, architectural implementations, neural network insights, concepts of generative AI, and hardware integration.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Foundations and Applications of Deep Learning**		**9**	CO1
	1	Deep Learning defined from Academic and industry perspective - Functions of a deep learning system - How a business uses deep learning - How deep learning works? - Deep Learning Architecture - Deep Learning Libraries - Deep Learning Implementation Framework.	4 hrs	
	2	The core of deep learning: ANN - Role of deep neural networks - Deep learning and machine learning - Deep learning vs Data Science - Teaching artificial neurons unknown functions - Error measurement in	5 hrs	

		neural networks - Gradient descent - Loss functions - Learning rates.		
II	**Deep Learning Implementation Pipeline**		**9**	CO2
	3	Deep Learning Workflow - Steps in Deep Learning in Implementation - Data Collection - Public Datasets - Existing Databases - Data Preparation - Cleaning Data - Feature Scaling - Handling categorical data & text - Model Engineering - Test Train Split - Handling Imbalanced Data - Model Training - Model Validation - Model Test - Model Outcome - Model Accuracy - Tune Hyperparameters - Deploy Model - Monitor Predictions - Manage your models.	9 hrs	
III	**Deep Learning Architectures and Implementation Frameworks**		**9**	CO3
	4	Deep Learning Architectures - Components of a deep learning solution - Data Generation, Collection, Training, Evaluation - Task Orchestration – Prediction.	4 hrs	
	5	Deep Learning Implementation Framework - Features of a good deep learning framework - Popular deep learning frameworks.	5 hrs	
IV	**Neural Networks: From Biological to Artificial and Generative AI**		**9**	CO4
	6	Neural Networks: An Overview - Biological Neural Networks - Artificial Neural Networks: Neurons – Connections – Learning rule. Deep Neural Networks: Classification: models - Convolutional Neural Networks - Regression: Artificial Neural Networks	7 hrs	
	7	Introduction to Generative AI – DALL E2, DALL E3.	2 hrs	
V	**Flexi Module: Data Strategy to Hardware Implementation:**		**9**	CO5
	8	Supervised Models - Unsupervised Models - Data Collection strategy for ML - How much data is needed - Is your data good enough? - Data Structure.	4 hrs	

	9	Building a Deep Learning Hardware system – Benefits – Challenges - Choosing the hardware components (GPU, TPU) - Choosing the software components - Choosing the OS - Adding Packages - Customer Churn - Who is going to churn? - When the churn will occur - Why(reason) is the churn occurring.	5 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Deep Learning from Scratch, by Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc. 2. Introduction to Deep Learning, Book by Eugene Charniak 3. Deep Learning: A Practical Approach, PB Paperback – 1 January 2018 by Rajiv Chopra.		

Lab Exercises	**30**	
1. Build a simple artificial Neural Network with 1 layer, with 1 neuron, and the input shape equal to 1, feed some data, use the equation y=5x-3, where x = -2, y=-4, and train the network. 2. Using Tensorflow Build a network with a single hidden layer and at least 300,000 trainable parameters 3. Using Tensorflow build 3 networks, each with at least 10 hidden layers such that: • The first model has fewer than 10 nodes per layer. • The second model has between 10-50 nodes per layer. • The third model has between 50-100 nodes per layer. 4. Build a network with at least 3 hidden layers that achieve better than 92% accuracy on validation and test data. You may need to train for more than 10 epochs to achieve this result. 5. Build a network for classification using the built-in MNIST dataset. 6. Build a network for classification using the built-in MNIST dataset and Use the sigmoid activation function. 7. Build a network for classification using the built-in MNIST dataset and Use the sigmoid activation function Use the categorical cross-entropy loss function. 8. Working Data Collection, Evaluation 9. Conduct an experiment on Object detection using a Convolution Neural Network. 10. Build a Recommendation system using Deep Learning techniques. 11. Working on Deep Learning Data Structures	30 hrs	CO6

12. Use Recurrent Neural Network to Perform Sentiment Analysis. 13. Using Generative Adversarial networks performs Image generation. 14. Deep Learning Hands-On Lab Work - Build, Test, and Deploy ML Models. 15. Implement Transfer learning to retrain models that have been trained on the ImageNet dataset to perform classification on the CIFAR dataset.		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Get Hands-on Knowledge, Skills, and Expertise to define deep learning from both the academic and industry perspective and all the related concepts	U	PSO2, PSO5
CO2	Adopt the best strategies for deep learning data collection, pre-processing, and model engineering tasks	Ap	PSO3, PSO5
CO3	Gain a comprehensive understanding of deep learning architectures and implementation frameworks	U	PSO2, PSO5
CO4	Get to know all the deep learning models involved in building deep learning applications	U, Ap	PSO2, PSO5
CO5	Understand all the data software, and hardware requirements for building deep learning models	U	PSO1, PSO4, PSO5
CO6	Get Hands-on Knowledge, Skills, and Expertise in a real-world use case implementation	Ap	PSO1, PSO4, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Deep Learning
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2, PSO5	U	C	L	

CO2	PO1, PO2, PO5, PSO3, PSO5	Ap	P	L	
CO3	PO1, PO2, PO5, PSO2, PSO5	U	C	L	
CO4	PO5, PSO2, PSO5	U, Ap	C	L	
CO5	PO1, PO5, PSO1, PSO4, PSO5	U	C	L	
CO6	PO1, PO5, PSO1, PSO4, PSO6	Ap	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	-	3	-	1	-
CO 2	-	-	3	-	1	-
CO 3	-	2	3	-	1	-
CO 4	-	2	-	2	1	-
CO 5	1	-	-	1	1	-
CO 6	1	-	-	1	-	1

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	-	-
CO2	2	1	-	-	2	-	-
CO3	2	1	-	-	1	-	-
CO4	-	-	-	-	2	-	-
CO5	1	-	-	-	1	-	-
CO6	1	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar

- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC351.1**				
Course Title	**MOBILE APPLICATION DEVELOPMENT**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	A foundational understanding of fundamental programming concepts and essential knowledge in web development basics.				
Course Summary	To prepare undergraduate students to possess a thorough comprehension of the principles, tools, and methodologies required for developing mobile applications that are of high quality, efficient, and user-friendly.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Mobile Computing**	**9**	
	1	Mobile Computing: Mobile Data Internetworking Standards	2 hrs	CO1
	2	Cellular data communication Protocols, Mobile Computing Applications.	2 hrs	
	3	Mobile Data Bases- Protocols, Scope, Tools and Technology.	2 hrs	
	4	Introduction to Android Studio, Android software development kit (SDK)	3 hrs	
II		**Android Development Environment and Application Lifecycle**	**9**	
	5	Application development tools (ADT) plugin, Emulators and Devices: Android virtual devices (AVDs).	4	CO2
	6	Connecting Androids to the development platform, Android Platform Architecture,	4	
	7	Android application Component's, Android Development Lifecycle, Running on the emulator, Running on a device.	4	
III		**Android User Interface Design**	**9**	
	9	Android User Interface, XML Fundamentals: Trees, Elements, Attributes, Examples.	2 hrs	CO3
	10	Simple Interactive programs, Building a Dynamic UI with Fragments, Android Intents and Filters.	2 hrs	
	11	Activity Lifecycles: Callbacks and activity pyramids, Launcher activity, Instantiation.	2 hrs	
	12	Destroying activities, Pausing, resuming, starting and stopping activities, saving and restoring activities**.**	3 hrs	
IV		**Notifications, Databases, and Multimedia**	**9**	
	13	Android Notifications, Android SQLite Database.	3 hrs	CO4
	14	Interaction with Other Apps, Location-Aware Apps.	3 hrs	
	15	Layout Hierarchies, Adding Audio, Photos and Videos to Apps.	3 hrs	

V	**Flexi Module: Advanced Mobile App Development**		**9**	
	16	Advanced user interface design.	3 hrs	CO5
	17	SQLite databases for data persistence, integration with external APIs, location-based services.	3 hrs	
	18	Multimedia integration, and asynchronous programming.	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Prasanna Kumar Dixt, ANDROID, Vikas Publishing 2. Kumkum Garg, Mobile computing Theory and Practice, Pearson **Internet Resources** 1. Neil Smyth, Android Studio Development Essentials, eBookFrency 2. https://developer.android.com/training/basics		

Lab Exercises	**30**	
1. Install and configure Android application development tools. • Familiarization with the Android Development Platform • Configure the settings of the Eclipse Integrated Development Environment (IDE)/ Android Studio for Android development. • Use the IDE to create an Android programming project. • Write a short introductory program. • Connect to an Android device and run the program on the device. 2. Writing Android Programs • Use the IDE to create an app project that has buttons, string resources, View and ViewGroup objects. • Experiment with XML, activities, manifests and intents in this project. • Use the emulator to test the app • Load the app onto an Android device and test it on actual hardware. 3. Expanding the App Capabilities with Lifecycles and more UI options • Use the IDE to create an app that has an activity lifecycle including some of the following: pause, resume, start, stop, destroy and restore. • Experiment with UI fragments, and flexible UIs in this project. • Use the emulator to test the app • Load the app onto an Android device and test it on actual hardware. 4. Demonstrating Inter-App Interaction • Use the IDE to create an app that has interapplication interaction.	30 hrs	CO6

• Experiment with sending and getting messages to other apps in this project. • Use the emulator to test the app • Load the app onto an Android device and test it on actual hardware 5. Building a program that demonstrates network operations • Use the IDE to create an app that has network awareness. • Experiment network and cloud messaging in this project. • Use the emulator to test the app • Load the app onto an Android device and test it on actual hardware 6. Incorporating audio and/or video into app projects • Use the IDE to create an app that has either audio or video (or both) incorporated into its design. • Experiment with volume, playback, photo-capture and/or video control in this project. • Use the emulator to test the app • Load the app onto an Android device and test it on actual hardware.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamentals of mobile computing, and Install the necessary components to work with Android	U	PSO3
CO2	Analyze and apply user interface design concepts through XML, master Android components, and comprehend activity lifecycles for effective development and management of Android applications.	An	PSO3, PSO4
CO3	Apply multimedia elements to create functional and interactive mobile applications.	Ap	PSO4
CO4	Develop advanced Android application features, incorporating notifications and SQLite databases	C	PSO3, PSO4, PSO5
CO5	Analyse and develop sophisticated and feature-rich Android apps.	An	PSO4
CO6	Create Android applications.	C	PSO3, PSO4,

			PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Mobile Application Development

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO3	U	F	L	
CO2	PO1, PO2, PO5, PSO3, PSO4	An	C	L	
CO3	PO1, PO2, PO5, PSO4	Ap	P	L	
CO4	PO1, PO5, PSO3, PSO4, PSO5	C	P	L	
CO5	PO1, PO5, PSO4	An	C	L	
CO6	PO1, PO5, PSO3, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	-	-	3	-	-
CO 2	-	-	3	3	-	-
CO 3	-	-	-	3	-	-
CO 4	-	-	2	3	2	-
CO 5	-	-	-	3	-	-
CO 6	-	-	2	3	2	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	-	-	2	-	-
CO2	2	2	-	-	2	-	-
CO3	2	1	-	-	2	-	-

CO4	1	-	-	-	2	-	-
CO5	1	-	-	-	2	-	-
CO6	1	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC352.1**				
Course Title	**NATURAL LANGUAGE PROCESSING**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Knowledge in Python, mathematical knowledge, machine learning concepts, and analytical skills.				
Course Summary	Explore the intricacies of language, from historical origins to practical applications, equipping them with the skills to analyze, summarize, and interpret text effectively.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction**		**12**	**CO1**
	1	History of NLP, Generic NLP system, levels of NLP, Knowledge in language processing , Ambiguity in Natural language , stages in NLP, challenges of NLP ,Applications of NLP	5 hrs	
	2	**Word Level Analysis:** Morphology analysis – survey of English Morphology, Inflectional morphology & Derivational morphology, Lemmatization, Regular expression, finite Automata, finite state transducers (FST), Morphological parsing with FST, Lexicon free FST Porter stemmer. N –Grams- N-gram Language model.	7 hrs	
II	**Syntax analysis**		**12**	**CO2**
	3	Part-Of-Speech tagging(POS)- Tag set for English (Penn Treebank) , Rule based POS	12 hrs	

		tagging, Stochastic POS tagging, Issues – Multiple tags & words, Unknown words. Introduction to CFG, Sequence labeling: Hidden Markov Model (HMM), Maximum Entropy.		
III	**Semantic Analysis**		**12**	**CO3**
	4	Lexical Semantics, Attachment for fragment of English sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, Robust Word Sense Disambiguation (WSD),Dictionary based approach	12 hrs	
IV	**Text Summarization andText Classification**		**12**	**CO4**
	5	Text summarization- LEXRANK, Optimization based approaches for summarization, Summarization evaluation, Text classification	12 hrs	
V	**Flexi Module: Sentiment Analysis and Opinion Mining**		**12**	**CO5**
	6	Sentiment Analysis introduction , Sentiment Analysis - Affective lexicons, Learning affective lexicons, Computing with affective lexicons, Aspect based sentiment analysis	12 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Natural Language Processing with Python", Steven Bird, Ewan Klein, Edward Loper, O'Reilly Media, 2009 2. Speech and Language Processing, Daniel Jurafsky, James H. Martin, Pearson, 2020 3. Foundations of Statistical Natural Language Processing, Christopher D. Manning, Hinrich Schütze, The MIT Press, 1999 4. Deep Learning for Natural Language Processing, Palash Goyal, Sumit Pandey, Karan Jain, Springer, 2018. 5. Natural Language Processing in Action, Lane, Howard, Hapke, Manning Publications, 2019		
Lab Exercises			**30**	CO6
1. Perform Word analysis and word generation to study morphology using Virtual Lab. 2. Implement stemming and lemmatization operations for a corpus. 3. Write a Python function to split a given sentence into words using space as a delimiter.			30 hrs	

4. Use any NLP library to tag each word in a sentence with its part of speech. 5. Generate bigrams for a given sentence and count their frequency. 6. Draw a simple parse tree for the sentence "The quick brown fox jumps over the lazy dog." 7. Perform and analyse an n-gram modelling forcorpuses using Virtual Lab. 8. Develop a sequence labeling system using HMM to tag a sentence with its corresponding parts of speech. 9. Analyze a given text and identify instances of homonymy, polysemy, synonymy, and hyponymy among the lexemes. 10. Determine the sentiment (positive, negative, neutral) of the following sentence: "The movie was not bad, but it could have been better.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain knowledge of NLP's history and apply basic language models to analyze words.	R, U	PSO2, PSO3
CO2	Learn to categorize words by their parts of speech and understand basic language patterns.	U, Ap	PSO2, PSO3
CO3	Understand word meanings and usage in different contexts.	U, An	PSO2, PSO3
CO4	Learn to create brief summaries of texts and classify them into categories.	Ap, An	PSO4, PSO5
CO5	Discover how to analyze and interpret opinions and emotions in text.	An, E, C	PSO5, PSO6
CO6	Analyze and process language data, utilizing tools for morphological operations, part-of-speech tagging, n-gram modeling, and sentiment analysis to gain insights from text.	C	PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Natural Language Processing
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO2, PSO3	R, U	F, C	L	-
CO2	PO1, PO2, PO5, PSO2, PSO3	U, Ap	C, P	L	-
CO3	PO1, PO2, PO5, PSO2, PSO3	U, An	C, P	L	-
CO4	PO1, PO5, PSO4, PSO5	Ap, An	P, M	L	-
CO5	PO1, PO5, PSO5, PSO6	An, E, C	C, M	L	-
CO6	PO1, PO5, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	-	-	-	3
CO 2	3	2	-	-	-	3
CO 3	3	2	-	-	-	3
CO 4	-	-	3	2	-	-
CO 5	-	-	-	3	3	-
CO 6	3	-	3	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	2	1	-	-	2	-	-
CO3	1	1	-	-	2	-	-
CO4	3	-	-	-	1	-	-
CO5	2	-	-	-	1	-	-
CO6	1	-	-	-	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium

3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5		✓		
CO6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC353.1**				
Course Title	**REINFORCEMENT LEARNING**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Solid foundation in machine learning and programming, particularly in Python				

Course Summary	Provides a comprehensive understanding of Reinforcement Learning, covering foundational concepts, advanced algorithms, and real-world applications, equipping students with both theoretical knowledge and practical skills in this dynamic field of AI

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Reinforcement Learning**		**9**	CO1
	1	Definitions and Scope of RL - Components of an RL Agent - Reinforcement Learning for AI - Use and applications of RL - The RL Framework: Rewards, States, and Actions - Overview of Markov Decision Processes (MDPs) - Goals and Objectives of RL	9 hrs	
II	**Exploration and Exploitation**		**9**	CO2
	2	Understanding Policy and Value Functions - The Bellman Equations for Value Iteration - Balancing Exploration and Exploitation - Multi-Armed Bandits and Bandit Algorithms - Epsilon-Greedy and Softmax Strategies.	9 hrs	
III	**Learning and Planning**		**9**	CO3
	3	Basics of Dynamic Programming in RL - Temporal Difference (TD) Learning: TD(0) and TD(λ) - Introduction to Q-Learning - SARSA: On-policy TD Control - Differences between Model-based and Model-free RL.	9 hrs	
IV	**Function Approximation and Control**		**9**	CO4
	4	Linear Function Approximation - Nonlinear Function Approximation: Neural Networks - Deep Q-Networks (DQN) and its Variants - Policy Gradient Methods: REINFORCE - Actor-Critic Methods: A3C and A2C.	9 hrs	
V	**Flexsi Module: Advanced RL**		**9**	CO5

	5	Current trends and future directions in RL - Recommender Systems-RL in personalization algorithms - RL applications in robotics - RL in self-driving car decision-making - Ethical implications of RL - Responsible AI and societal impact.	9 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Reinforcement Learning: An Introduction by Richard S. Sutton and Andrew G. Barto, MIT Press, Second edition, 2018.		

Lab Exercises	**30**	
Lab 1: Introduction to RL Environments • **Question:** How does the agent interact with the environment in OpenAI Gym? • **Tools:** Python, OpenAI Gym library **Lab 2: Implementing Simple Bandit Algorithms** • **Question:** Implement and compare the performance of different bandit algorithms on a simulated slot machine. • **Tools:** Python, NumPy library **Lab 3: Dynamic Programming in Gridworld** • **Question:** How would you apply value iteration to find the optimal policy in a Gridworld environment? • **Tools:** Python, Matplotlib for visualization **Lab 4: Temporal Difference Learning** • **Question:** Implement TD(0) for policy evaluation and demonstrate its convergence. • **Tools:** Python, Jupyter Notebook for iterative development **Lab 5: Q-Learning in a Maze**	30 hrs	CO6

- **Question:** Develop a Q-Learning agent to navigate a maze and reach a goal state.
- **Tools:** Python, OpenAI Gym for the maze environment

Lab 6: SARSA vs. Q-Learning

- **Question:** Compare the learning curves of SARSA and Q-Learning in a simple environment.
- **Tools:** Python, OpenAI Gym, Matplotlib for plotting results

Lab 7: Function Approximation

- **Question:** How does function approximation improve the scalability of RL algorithms?
- **Tools:** Python, Scikit-learn for linear models

Lab 8: Deep Q-Networks (DQN)

- **Question:** Implement a DQN to play a simple video game and analyze its performance.
- **Tools:** Python, TensorFlow or PyTorch, OpenAI Gym

Lab 9: Policy Gradient Methods

- **Question:** Write a REINFORCE algorithm to solve an episodic task and discuss its efficiency.
- **Tools:** Python, TensorFlow, or PyTorch

Lab 10: Actor-Critic Methods

- **Question:** Create an Actor-Critic model and compare it to DQN on the same task.
- **Tools:** Python, TensorFlow, or PyTorch

Lab 11: Hierarchical RL

- **Question:** Design a hierarchical agent and explain how it solves complex tasks more efficiently.
- **Tools:** Python, TensorFlow, or PyTorch

Lab 12: POMDPs and Belief States

• **Question:** Implement belief state updates in a POMDP and solve a simple task. • **Tools:** Python, OpenAI Gym for POMDP environments **Lab 13: Multi-agent RL** • **Question:** Set up a cooperative multi-agent scenario and observe the emergent behaviors. • **Tools:** Python, OpenAI Gym, Multi-agent reinforcement learning framework **Lab 14: Exploration Strategies** • **Question:** Experiment with different exploration strategies and measure their impact on learning. • **Tools:** Python, OpenAI Gym, NumPy for statistical analysis **Lab 15: Current Research in RL** • **Question:** Replicate an experiment from a recent RL research paper and discuss the results. • **Tools:** Python, relevant RL libraries/frameworks, research paper for reference		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the foundational principles of RL and its role in AI and be able to formulate problems as MDPs and apply basic RL algorithms.	U, Ap	PSO2, PSO3, PSO5
CO2	Gain proficiency in implementing bandit algorithms and understanding their applications.	Ap	PSO4, PSO5
CO3	Able to design and evaluate model-based and model-free RL algorithms.	Ap, An	PSO3, PSO5
CO4	Develop skills in function approximation for RL and	Ap, U, An	PSO3, PSO5,

	implement advanced algorithms like DQN and understand policy gradient methods		PSO6
CO5	Explore cutting-edge RL topics and their real-world applications and also be prepared to engage with current research and contribute to the field of RL	U, E, C	PSO2, PSO3, PSO5, PSO6
CO6	Able to implement and analyze reinforcement learning algorithms in simulated environments	Ap, An	PSO1, PSO3, PSO4, PSO5.

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Reinforcement Learning
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2, PSO3, PSO5	U, Ap	C, P	L	
CO2	PO1, PO2, PO5, PSO4, PSO5	Ap	P	L	
CO3	PO1, PO5, PSO3, PSO5	Ap,An	P,C	L	
CO4	PO2, PO5, PSO3, PSO5, PSO6	Ap, U, An	P, C	L	
CO5	PO1, PO5, PSO2, PSO3, PSO5, PSO6	U, E, C	C, M	L	
CO6	PO1, PO2, PO5, PSO1, PSO3, PSO4, PSO5.	Ap, An	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	3	-	3	-
CO 2	-	-	-	3	3	-
CO 3	-	-	3	-	3	-
CO 4	-	-	3	-	3	3
CO 5	-	3	3	-	3	3
CO 6	3	-	3	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	3	-	-
CO2	2	1	-	-	3	-	-
CO3	1	-	-	-	2	-	-
CO4	-	1	-	-	2	-	-
CO5	2	-	-	-	2	-	-
CO6	2	1	-	-	2	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC354.1**				
Course Title	**MASTERING FULL STACK DEVELOPMENT**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3hours	-	2 hours	5 hours
Pre-requisites	1. Basic understanding of HTML, CSS, and JavaScript. 2. Familiarity with programming concepts. 3. Prior experience with web development is helpful but not required.				
Course Summary	This course provides training in full stack web development using MongoDB as the database management system. Students will learn how to design, develop, and deploy scalable web applications using MongoDB for data storage, along with modern front-end and back-end technologies.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Full Stack Development**		**9**	
	1	Overview of full stack development: Introduction to the concept of full stack development, Explanation of the roles of front-end and back-end developers, Discussion on the importance of full stack development in modern web development.	3 hrs	CO1
	2	Introduction to MongoDB and NoSQL databases: Explanation of NoSQL databases and their advantages over relational databases, Introduction to MongoDB, its features, and use	3 hrs	

		cases, Installation of MongoDB and basic setup.		
	3	Setting up development environment: Installing necessary software tools such as text editors (e.g., Visual Studio Code), version control systems (e.g., Git), and development frameworks (e.g., Node.js), Creating a basic project structure for a full stack application,Setting up a local development server for testing.	3 hrs	
II	**MongoDB Basics**		**9**	
	5	CRUD operations in MongoDB: Practice with MongoDB shell commands for Create, Read, Update, and Delete operations, Hands-on exercises for inserting, querying, updating, and deleting documents in MongoDB collections.	3 hrs	CO2
	6	Data modeling with MongoDB: Understanding the document-oriented data model of MongoDB, Designing a data schema for a sample application and creating collections based on the schema, Exploring embedding and referencing documents for data organization.	3 hrs	
	7	Indexing and query optimization: Introduction to indexing in MongoDB and its importance for query performance,Creating indexes on MongoDB collections for optimizing query execution, Analyzing query plans and using explain() method for query optimization.	3 hrs	
III	**Building RESTful APIs with Node.js and Express.js**		**9**	
	9	Introduction to Node.js and Express.js: Setting up a basic Node.js and Express.js server, Exploring the features and benefits of Node.js and Express.js for server-side development, Creating routes and handling HTTP requests using Express.js.	3 hrs	CO3
	10	Designing RESTful API endpoints: Understanding the principles of RESTful architecture, Designing RESTful API	3 hrs	

		endpoints for CRUD operations, Implementing route handlers and middleware for request validation and error handling.		
	11	Handling HTTP requests and responses: Handling different types of HTTP requests (GET, POST, PUT, DELETE) in Express.js,Parsing request data and sending appropriate responses, Implementing error handling middleware for managing server errors.	5 hrs	
IV	**User Authentication and Authorization, Front-end Development with React.js**		**9**	
	13	Implementing user authentication with JSON Web Tokens (JWT)	3 hrs	CO4
	14	Introduction to React.js and component-based architecture	3 hrs	
	15	Managing state with React Hooks, Consuming RESTful APIs with Axios	3 hrs	
V	**Flexi Module: Full Stack Project Development**		**9**	
	16	Integrating MongoDB with Node.js and React.js	3 hrs	CO5
	17	Building a full stack web application	3 hrs	
	18	Deployment strategies and best practices	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Full Stack Development with MongoDB and Node.js" ,Author: Brad Dayley, Publisher: O'Reilly Media,ISBN: 978-1491900947 **Websites:** 1. https://docs.mongodb.com/ 2. https://nodejs.org/docs/latest/api/ 3. https://expressjs.com/ 4. https://legacy.reactjs.org/docs/getting-started.html 5. https://developer.mozilla.org/en-US/		

Lab Exercises	**30**	
1. Overview of Full Stack Development: • Research and compile a list of popular full stack development frameworks and technologies. **2. Introduction to MongoDB and NoSQL databases:** • Install MongoDB on your local machine.	30 hrs	CO6

- Practice basic CRUD operations (Create, Read, Update, Delete) using the MongoDB shell.
- Explore MongoDB's data model by creating collections and inserting documents.
- Setting Up Development Environment:
- Install and set up a text editor (e.g., Visual Studio Code).
- Initialize a new Git repository for version control.
- Create a basic folder structure for your full stack project (e.g., client, server).

3. MongoDB Basics

- Write MongoDB queries to perform CRUD operations on a sample database.
- Experiment with different query operators and methods (e.g., find, insertOne, updateMany, deleteOne).
- Data modeling with MongoDB:
- Design a data schema for a simple application (e.g., blog, e-commerce).
- Create collections and embed documents based on the data schema.
- Practice querying nested documents and arrays.
- Indexing and query optimization:
- Create indexes on MongoDB collections for frequently queried fields.
- Analyze query performance using explain() method.
- Optimize queries by utilizing indexes and avoiding common pitfalls.

4. Building RESTful APIs with Node.js and Express.js

- Introduction to Node.js and Express.js:
- Set up a basic Node.js and Express.js server.
- Create routes for handling HTTP requests (GET, POST, PUT, DELETE).
- Test the API endpoints using tools like Postman or Insomnia.
- Designing RESTful API endpoints:
- Define routes and corresponding controller functions for CRUD operations.
- Implement middleware for request validation and error handling.
- User Authentication and Authorization
- Implementing user authentication with JSON Web Tokens (JWT):
- Create routes for user registration and login.
- Generate JWT tokens upon successful authentication.
- Secure routes by verifying JWT tokens.
- Role-based access control:

• Define user roles (e.g., admin, regular user). • Implement middleware to restrict access to certain routes based on user roles. **5. Front-end Development with React.js** • Introduction to React.js and component-based architecture: • Set up a new React.js project using create-react-app. • Create functional and class components for the user interface. • Understand the component lifecycle and state management. • Managing state with React Hooks: • Convert class components to functional components using useState and useEffect hooks. • Practice managing state and side effects using hooks. **6. Full Stack Project Development** • Integrating MongoDB with Node.js and React.js: • Connect the React.js front end to the Node.js backend using Axios or Fetch API. • Implement CRUD operations in the front end to interact with MongoDB through the backend APIs. • Building a full stack web application: • Combine the front end and back end components to create a fully functional web application. • Test the application for functionality and responsiveness. • Deploy the application to a cloud platform (e.g., Heroku, AWS) for production use.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the fundamentals of full stack web development.	U	PSO3
CO2	Analyse proficiency in MongoDB for database management.	An	PSO4
CO3	Develop RESTful APIs using Node.js and Express.js.	C	PSO3
CO4	Implement user authentication and authorization and create dynamic front-end interfaces using modern	C	PSO4

	JavaScript frameworks.		
CO5	Deploy full stack applications to cloud platforms.	C	PSO4
CO6	Gain practical expertise in full stack development by mastering essential technologies such as MongoDB, Node.js, Express.js, React.js, and RESTful API design.	C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Mastering Full Stack Development
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO3	U	C	L	
CO2	PO2, PO5, PSO4	An	C	L	
CO3	PO2, PO5, PSO3	C	P	L	
CO4	PO2, PO5, PSO4	C	P	L	
CO5	PO1, PO2, PO5, PSO4	C	P	L	
CO6	PO1, PO2, PSO3, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	-	-	2	-	-
CO 2	2	3	-	2	-	-
CO 3	-	-	1	2	-	-
CO 4	-	-	2	3	-	-
CO 5	-	1	-	3	-	-
CO6	-	-	3	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	2	-	-	-	3	-	-
CO3	1	-	-	-	2	-	-
CO4	2	-	-	-	2	-	-
CO5	1	1	-	-	2	-	-
CO6	3	3	-	-	-	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6DSECSC355.1**				
Course Title	**SOFTWARE TESTING**				
Type of Course	**DSE**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Programming Fundamentals, Software Engineering Concepts				
Course Summary	This course dives into the theory and practice of software testing, equipping you to ensure quality, functionality, and performance in software applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Introduction**	**9**	CO1
	1	**Preliminaries:** Software testing, Humans, errors, and testing, Software Quality, Requirements, behaviour, and correctness, Correctness Vs reliability, Testing and Debugging, Test Metrics, Software and Hardware testing, Testing and Verification, Defect Management, Test generation strategies, Static testing, Model-based testing and model checking, Types of testing, Saturation effect, Principles of testing, Tools	5 hrs	
	2	**Preliminaries: Mathematical** Predicates and Boolean expressions, Control flow graph, Program dependence graph, tools	4 hrs	
II		**Test Generation**	**9**	CO2

	3	Domain Partitioning, test selection problem, equivalence partitioning, Boundary value analysis, Category- partition method, Predicate analysis: domain testing, Cause-effect graphing, test using predicate syntax, basic path testing, scenarios and tests, Test generation from finite state models : software design and testing, software design and testing, finite state machines, conformance testing, a fault model, characterization set, Test generation from combinatorial designs, test design process, fault model, Latin squares, Pairwise design: binary and Multivalued factors.	9 hrs	
III	**Test Accuracy Assessment and Phases of Testing**		**9**	CO3
	4	**Test accuracy assessment and enhancement :** Test accuracy assessment using control flow and data flow, Test accuracy: basics, criteria based control flow, data flow, structural and functional testing scalability of coverage measurement	4 hrs	
	5	**Phases of testing:** Test selection, minimization, and prioritization for regression testing, Regression test process, selecting regression tests, Test selection using execution trace, dynamic slicing, Scalability of test selection algorithms, test minimization,Test prioritization	5 hrs	
IV	**Types of Testing**		**9**	CO4
	6	Unit testing- test design, using junit, stubs and mocks, Integration testing – integration errors, dependence, OO Vs non-OO programs, integration hierarchy, finding a near-optimal test order, test generation, test assessment., Test automation: Benefits, challenges, and popular test automation frameworks like Selenium, Robot Framework. (Image of the Selenium logo), Continuous Integration and Continuous Delivery (CI/CD): Integrating	5 hrs	

		testing into the CI/CD pipeline for faster and more efficient software delivery. (Image of a CI/CD pipeline diagram)		
	7	Advanced Testing Topics: Model-based testing, mutation testing, data-driven testing, exploratory testing, and AI in software testing. (Image of an AI-powered software testing tool interface)	4 hrs	
V	**Flexi Module:**		**9**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Foundations of Software Testing, 2/e, Aditya P Mathur, Pearson Education India, 2013 **Websites:** 1. https://www.selenium.dev/ 2. https://www.ministryoftesting.com/ 3. https://club.ministryoftesting.com/ 4. https://www.softwaretestinghelp.com/how-to-test-smarter/		

Lab Exercises	**30**	
1. Open a Website: Use Selenium to open a website of your choice and verify that it loads correctly. 2. Click on a Button: Write a test to click on a button on the website and verify that it performs the expected action. 3. Fill out a Form: Automate the process of filling out a form on the website and verify that the form is submitted successfully. 4. Verify Text on a Page: Write a test to verify that specific text is present on a page, such as a heading or a paragraph. 5. Navigate to Different Pages: Use Selenium to navigate to different pages on the website and verify that each page loads correctly. 6. Capture a Screenshot: Write a test to capture a screenshot of a page and save it to a file. 7. Handle Alerts: Write a test to handle an alert that appears on the page, such as a JavaScript alert or confirmation dialog. 8. Verify Page Title: Write a test to verify that the title of a page is correct. 9. Check Element Visibility: Write a test to check if a specific element on the page is visible or hidden. 10. Test Link Navigation: Write a test to click on a link and verify that it navigates to the correct page.	30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Equip students with the theoretical and practical knowledge of software testing principles and techniques.	U	PSO1,PSO2
CO2	Develop skills in designing, implementing, and evaluating effective test plans and test cases.	R, U	PSO2
CO3	Gain exposure to various testing methodologies and tools.	A	PSO3
CO4	Appreciate the importance of test automation and continuous integration/continuous delivery (CI/CD) pipelines.	E	PSO2, PSO3
CO5	Gain proficiency in automating website interactions and testing web applications using Selenium	C	PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Software Testing

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO2, PO5, PSO1, PSO2	U	F,C	L	
CO2	PO1, PO2, PO5, PSO2	R, U	C, P	L	
CO3	PO1, PO5, PSO3	A	P	L	
CO4	PO1, PO5, PSO2, PSO3	E	C, P	L	
CO5	PO1, PO5, PSO4, PSO5	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	1	-	-	-	-

CO2		2	-	-	-	-
CO3	-	-	2	-	-	-
CO4	-	-2	3		-	-
CO5	-		-	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	3	-	-
CO2	2	1	-	-	3	-	-
CO3	2	-	-	-	2	-	-
CO4	1	-	-	-	2	-	-
CO5	1	-	-	-	1	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓			✓

Skill Enhancement Course (SEC)

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK6SECCSC350.1**				
Course Title	**DATA VISUALIZATION USING TABLEAU**				
Type of Course	**SEC**				
Semester	**VI**				
Academic Level	**3**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	1. Basic understanding of excel. 2. Basic understanding of sql.				
Course Summary	Create interactive graphs and charts in dashboards and worksheets to gain business insights. Employ best practices in data visualization to develop charts, maps, tables, and other visual representations of data. Tableau is a very powerful data visualization tool that can be used by data analysts, scientists, statisticians, etc. to visualize the data and get a clear opinion based on the data analysis.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to data visualization**		**9**	CO1
	1	**Introduction to data visualization**: Introduction: Data Visualization, Importance of Data Visualization, Data Wrangling, Tools and Libraries for Visualization, Data for data visualization- Design principles- Categorical, time series, and statistical data visualization	9 hrs	
II	**Data Exploration**		**9**	CO2
	2	Comparison Plots: Line Chart, Bar Chart and Radar Chart; Relation Plots: Scatter Plot,	9 hrs	

		Bubble Plot, Correlogram and Heatmap; Composition Plots: Pie Chart, Stacked Bar Chart, Stacked Area Chart, Venn Diagram; Distribution Plots: Histogram, Density Plot, Box Plot, Violin Plot; Geo Plots: Dot Map, Choropleth Map, Connection Map; What Makes a Good Visualization?		
III	**Tableau**		**9**	CO3
	3	Introduction to Tableau- installation, architecture and environment. Various data sources, data joining, data blending, Worksheets in Tableau.	9 hrs	
IV	**Charts and Plots**		**9**	CO4
	4	The Visualization Dashboard, Charts in Tableau- bar chart, line chart, pie chart, crosstab, scatter plot, bubble chart, bullet graph, box plot, tree map, bump chart, Gantt chart, histogram, motion chart and waterfall chart.	9 hrs	
V	**Flexi Module:**		**9**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Visual Analytics with Tableau", Alexander Loth, Wiley Publications, 1st edition (2019). 2. Data Visualization workshop, Tim Grobmann and Mario Dobler, Packt Publishing, ISBN 9781800568112 3. Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", Claus O Wilke, O' Reilly Media Publications, 1st edition (2019). 4. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master", Ryan Sleeper, O' Reilly Media Publications, 1st edition (2018). 5. Information Dashboard Design: Displaying Data for At-a-Glance Monitoring", Stephen Few, Analytics Press; 2ndEdition (2013). **Websites:** 1. https://www.tableau.com/learn/articles/data-visualization		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	To understand data for data visualizations	U	PSO2
CO2	To understand exploratory data analysis using visualization.	U	PSO2
CO3	To identify appropriate data visualization techniques given particular requirements imposed by the data.	An	PSO4
CO4	To design, create and interpret data visualizations	C	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Data Visualization Using Tableau
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO	PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2	U	C	L	
CO2	PO1, PO5, PSO2	U	C	L	
CO3	PO1, PO5, PSO4	An	P	L	
CO4	PO1, PO5, PSO4	C	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	-	3	-	-	-
CO 3	-	-	1	3	-	-
CO 4	-	-	1	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	3	-	-
CO2	3	-	-	-	3	-	-
CO3	3	-	-	-	3	-	-
CO4	3	-	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓		✓

Semester VII

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC400.1**				
Course Title	**ADVANCED CONCEPTS IN JAVA PROGRAMMING**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Knowledge in Core Java and database concepts				
Course Summary	Provides a comprehensive understanding of advanced Java programming concepts, including Jakarta EE, Servlets, JSP, EJB, MVC, JSF, Spring, Hibernate, and REST, with a strong emphasis on practical programming exercises.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Enterprise Java**		**9**	CO1
	1	Jakarta EE – Overview – Specifications – Web and Web Service Specifications – Architecture of JEE applications	4 hrs	
	2	Overview of JDBC - JDBC Drivers - JDBC Driver types - Connecting to a Database.	5 hrs	
II	**Web Applications with Servlet and JSP**		**9**	CO2
	3	Servlet – Introduction - Types: Generic Servlet, HttpServlet - Servlet Life Cycle	5 hrs	
	4	JSP Architecture - JSP Life cycle - JSP Implicit objects - Include Directive JSP: include Action - JSP Model1 and Model2 Architectures.	4 hrs	
III	**Enterprise Java Beans**		**9**	CO3

	5	EJB Architecture: Logical Architecture, Software Architecture -EJB Container - Life Cycle of EJB with example - Life cycle of Session Bean - Life cycle of Entity Bean – Message driven Beans.	9 hrs	
IV	**MVC and Java Server Faces**		**9**	CO4
	6	Understanding the need for MVC – Frameworks Architecture - Implementing MVC with request dispatcher - MVC Design Pattern - Implementing MVC in Java web applications	5 hrs	
	7	Introduction to JSF - JSF architecture - Managed beans and navigation.	4 hrs	
V	**Flexi Module: Spring, Hibernate and REST**		**9**	CO5
	8	Introduction to Spring - Dependency Injection and Inversion of Control - Spring AOP	3 hrs	
	9	Introduction to Hibernate - Object-Relational Mapping - Hibernate architecture	3 hrs	
	10	Introduction to REST - Principles of RESTful architecture - Building RESTful services in Java	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Beginning Jakarta EE, Elder Moraes, Apress, 2020. 2. Advanced Java Programming, Uttam K. Roy, Oxford University Press, 2015. 3. Java Persistence with Spring Data and Hibernate, Catalin Tudose, Packt Publishing, 2022. 4. Tom Valesky, “Enterprise Java Beans”, Addison-Wesley.		
Lab Exercises			**30**	CO6
1. Write a simple Java program that connects to a database using JDBC and fetches some data. 2. Develop Web Applications Using ServletRequest, ServletResponse. 3. Create a Jakarta EE application that displays a simple message. 4. Create a Servlet that handles GET and POST requests and displays a different message for each1. 5. Develop a JSP page that displays the current date and time. 6. Create a simple session bean that stores and retrieves a user’s name. 7. Develop an entity bean that represents a simple entity like a Book with properties like title and author. 8. Implement a simple web application using MVC design pattern that displays a list of books. 9. Create a JSF application that takes user input and displays it. 10. Create a Spring application that uses Dependency Injection to inject a service into a Spring Bean.			30 hrs	

11. Develop a Hibernate application that stores and retrieves entities to a database. 12. Create a RESTful service in Java that returns a list of books.		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Gain a comprehensive understanding of Jakarta EE, JDBC, and how to connect to databases using Java.	U, Ap	PSO2, PSO4
CO2	Learn to develop dynamic web applications using Servlets and JSP, understanding their lifecycles and architectures.	U, Ap, An	PSO2, PSO3, PSO4
CO3	Understand the architecture and lifecycle of different types of EJBs and how they facilitate building robust enterprise applications.	U, Ap, An	PSO2, PSO3
CO4	Learn the MVC design pattern, its implementation in Java web applications, and building JSF applications with managed beans.	U, Ap, An, E	PSO2, PSO3, PSO4
CO5	Understand the principles of Spring, Hibernate, and RESTful services, and how to use them in Java applications.	U, Ap, An, E	PSO2, PSO3, PSO4, PSO5
CO6	Apply the concepts learned in previous modules to practical programming exercises, developing a range of Java applications.	Ap, An, E, C	PSO3, PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Advanced Concepts in Java Programming
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2, PSO4	U, Ap	F, C	L	
CO2	PO1, PO2, PSO2, PSO3, PSO4	U, Ap, An	C, P	L	
CO3	PO1, PO2, PSO2, PSO3	U, Ap, An	C, P	L	

CO4	PO1, PO2, PSO2, PSO3, PSO4	U, Ap, An, E	C, P, M	L	
CO5	PO1, PO2, PSO2, PSO3, PSO4, PSO5	U, Ap, An, E	C, P, M	L	
CO6	PO1, PO2, PO5, PSO3, PSO4, PSO5	Ap, An, E, C	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	1	2	-	3	1	-
CO 2	1	2	3	-	-	-
CO 3	1	2	3	-	-	-
CO 4	1	2	3	3	-	-
CO 5	1	2	3	3	3	-
CO 6	1	2	3	3	3	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	-	-	-	2	-	-
CO2	1	1	-	-	-	-	-
CO3	1	1	-	-	-	-	-
CO4	1	2	-	-	-	-	-
CO5	-	-	-	-	-	-	-
CO6	2	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC401.1**				
Course Title	**POWER OF CLOUD COMPUTING**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	1. Knowledge of network protocols, distributed computing and familiarity with web services 2. Knowledge of Java programming.				
Course Summary	This course is designed to provide participants with the understanding of essential core concepts of cloud computing, benefits and model of cloud computing, it's enabling technologies, cloud services, virtualization and programming models.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Cloud Computing**		**12**	**CO1**
	1	Introduction to Cloud Computing, - Evolution, Definition, Characteristics of Cloud Computing, Open Challenges, Service Models- SaaS, PaaS, IaaS,Deployment Models- Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud,	12 hrs	

		Comparison of Models, Service Providers, Why Cloud Computing, Working of Cloud Computing, Comparison of Cloud technology with traditional computing, Applications of Cloud Computing.		
II	**Technologies in Cloud Computing**		**12**	**CO2**
	2	Technologies in Cloud Computing- Eras of Computing, High Performance Computing, Parallel vs Distributed Computing, Elements of Distributed Computing- General Concepts, Elements of Distributed Computing- Components, Peer to Peer, Client Server, Grid Computing, Utility Computing, Autonomic Computing, Cloud Enabling Technologies- Remote Procedure Call, Service Oriented Architecture (SOA), Web Services (WS) and WSDL Models, Microservices ,Representational State Transfer (REST) – Basic Concepts only, Publish/ Subscribe Model, Virtualization, Need for Virtualization, Types of Virtualizations- Network Server, Storage. Components of Virtual Environment- Guest, Host Virtualization layer, Characteristics of Virtualization, Advantages and Disadvantages of Virtualization.	12 hrs	
III	**Cloud Computing Architecture and Services**		**12**	**CO3**
	3	Cloud Computing Architecture and Services – Cloud Architecture, Infrastructure as a Service, Public Cloud and Service Offerings, Google App Engine, GAE Architecture, Functional modules of GAE, GAE Applications, Amazon Web Services (AWS), Amazon Cloud Computing Infrastructure, Microsoft Windows Azure, Inter-cloud Resource Management- Extended Cloud Computing Services, Resource Provisioning and Platform Deployment, Virtual Machine Creation and Management	12 hrs	
IV	**Cloud Computing Security & Advancements**		**12**	**CO4**
	4	Cloud Computing Security & Advancements- Network Threats and Data Integrity, Threats to Systems and Networks, Security Responsibilities, Data Protection, Infrastructure Cloud Management tasks, Brokered Cloud Storage Access, Privacy concern and Cloud Computing, Hadoop- Introduction, Hadoop Architecture, Working of Hadoop, MapReduce, Hadoop Distributed File System, Hadoop YARN, OpenStack	12 hrs	
V	**Flexi Module:**		**12**	

Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Cloud Computing Simply in Depth, Second Edition, Ajit Singh. Chapters 1, 2, 3, 4, 6 2. Kai Hwang, Jack Dungaree, and Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, MK Publishers, 2012. Chapters 1, 4 3. Cloud Computing Black Book, Kailash Jayaswal, Jaganath Kallakurichi, Donald j Houde, Dr Deven Shah, Kogent Learning Solutions Inc, dreamtech Press ,Chapter 1 4. Mastering Cloud Computing, 2019 edition, Mc Graw Hill, Rajkumar Buyya, Christioan Vecchiola, S Thamarai Selvi **Websites:** 1. http://www.webopedia.com/TERM/C/cloud_computing.html 2. http://aws.amazon.com/ 3. http://www.vmware.com/in/cloud-computing/overview

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Identify the basic concepts of Cloud Computing and understand the computing paradigms and compare them.	U	PSO2
CO2	Ability to choose a particular deployment model according to scenario.	Ap	PSO3
CO3	Develop an understanding of virtualization technology and its different dimensions.	An	PSO2
CO4	Compare various Cloud Computing technologies and analyze various cloud programming models and apply them to solve problems on the cloud.	Ap	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Power of Cloud Computing
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO6, PSO2	U	C	L	
CO2	PO1, PO2, PSO3	Ap	P	L	

CO3	PO1, PO6, PSO2	An	C	L	
CO4	PO1, PO2, PO6, PSO4	Ap	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	-	3	-	-	-
CO 3	-	2	-	-	-	-
CO 4	-	-	-	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	-	-	2	-
CO2	2	2	-	-	-	-	-
CO3	2	-	-	-	-	2	-
CO4	3	3	-	-	-	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations

CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC402.1**				
Course Title	**CONTENT MANAGEMENT SYSTEMS**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge of web technologies like HTML, CSS, and JavaScript				
Course Summary	This course is designed to provide an introduction to using WordPress as a Content Management System (CMS). Students will learn how to install WordPress, navigate the dashboard, publish content, customize templates, optimize their websites, and explore popular SEO plugins. Through hands-on exercises, students will gain practical experience in using WordPress as a CMS.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Getting Started with WordPress**		**9**	CO1
	1	Introduction: Using WordPress as a Content Management System, Installing WordPress: Setting up a local development environment using software like XAMPP, Installing WordPress on a web hosting server.	4 hrs	

	2	Overview of the Dashboard, Dashboard Sections: Dashboard Home, Posts, Pages, Media, Comments, Appearance, Plugins, Users, Tools, and Settings.	5 hrs	
II	**Publishing Your Website with WordPress**		**9**	CO2
	3	Writing your first post, Creating a static page, Uploading and displaying photos and galleries, Exploring podcasting and video blogging, Working with custom fields	9 hrs	
III	**Using WordPress as a content Management System**		**9**	CO3
	4	Creating Different Page views using WordPress templates, Creating a template for each post category, Pulling in content from a single category, Using sidebar templates, Creating custom styles, Working with Custom post types	6 hrs	
	5	Optimizing your WordPress site	3 hrs	
IV	**Understanding Analytics**		**9**	CO4
	6	Understanding the importance of analytics, Exploring the options for tracking data, Understanding key analytics terminology	5 hrs	
	7	Adding google analytics to your WordPress site	4 hrs	
V	**Flexi Module: Search Engine Optimization**		**9**	CO5
	8	Understanding the importance of search engine optimization, Outlining the advantages that WordPress presents for SEO, Understanding how search engines see your content, Optimizing your site under the hood, Creating search engine strategies	6 hrs	
	9	Exploring popular SEO plugins	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** **1.** WordPress All-in-One For Dummies, 4th Edition, Lisa Sabin-Wilson, Wiley & Sons, Inc., 2019 **Websites:** **1.** https://learn.wordpress.org/tutorials/		
Lab Exercises			**30**	CO6
1. Install WordPress locally using XAMPP or another local development environment tool. 2. Install WordPress on a web hosting server using a control panel like cPanel or manually via FTP. 3. Navigate through the WordPress dashboard and explore each section. Create a sample post, page, and media item.			30 hrs	

4. Write and publish a blog post on a chosen topic, including adding images and categories. 5. Create a static page and set it as the homepage of your WordPress site. 6. Install and activate a new WordPress theme. Customize its appearance by changing colors, fonts, and layout options. 7. Create a custom page template for a specific section of your website, such as a portfolio or testimonial page. 8. Install and configure a caching plugin to improve the performance of your WordPress site. 9. Integrate Google Analytics into your WordPress site and explore the data collected, including traffic sources and user behavior. 10. Install and configure an SEO plugin such as Yoast SEO or All in One SEO Pack. Optimize your website's content for search engines. 11. Explore and install other useful WordPress plugins for security, backup, and social media integration. 12. Set up a podcasting or video blogging section on your WordPress site. Upload and publish multimedia content. 13. Create custom post types for specific content types, such as testimonials, events, or products. Display them on your site using custom templates.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Deploy WordPress for comprehensive website management.	Ap	PSO4
CO2	Create their WordPress website with posts, pages, media, and customized content like podcasts and videos.	C	PSO4
CO3	Deploy WordPress as a dynamic content management system.	Ap	PSO4,PSO5
CO4	Demonstrate a strong understanding of analytics and practical implementation of Google Analytics within a WordPress website.	An	PSO3, PSO4
CO5	Develop expertise in maximizing WordPress website	E	PSO2, PSO4

	visibility on search engines.		
CO6	Develop practical proficiency in the installation, configuration, and customization of WordPress websites.	Ap	PSO3,PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Content Management Systems
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO4	Ap	P	L	-
CO2	PO1, PO5, PO2,PSO4	C	P	L	-
CO3	PO1, PO5, PSO4, PSO5	Ap	P	L	-
CO4	PO2, PO6, PSO3, PSO4	An	C	L	-
CO5	PO2, PO5, PSO2, PSO4	E	P	L	-
CO6	PO1, PO5, PSO3, PSO4	Ap	P	-	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	-	-	3	-	-
CO 2	-	-	-	3	-	-
CO 3	-	-	-	3	2	-
CO 4	-	-	2	3	-	-
CO 5	-	1	-	3	-	-
CO 6	-	-	-	3	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	2	-	-
CO2	3	-	-	-	2	-	-

CO3	3	-	-	-	2	-	-
CO4	-	3	-	-	-	2	-
CO5	-	3	-	-	2	-	-
CO6	3	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC403.1**				
Course Title	**E-GOVERNANCE**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Knowledge of Information Technology concepts is desirable				
Course Summary	This course provides a comprehensive understanding of e-governance and its potential to transform the way governments operate and interact with citizens.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Concepts of E-Governance**	**12**	CO1
	1	Meaning, Concept of E-Governance, Objectives of E-Governance.	3 hrs	
	2	Types of Interactions of E- Governance- Government to Customer, Government to Employees, Government to Government, Government to Business.	3 hrs	
	3	Advantages, Disadvantages, Importance of E-Governance.	3 hrs	
	4	Components-Pillars of E-Governance, Goals of E-Governance, Some E-governance Initiatives in India	3 hrs	
II		**Evolution of E-Governance**	**12**	CO2
	5	Phases of E- Government in India-Informatics based E- Government	3 hrs	
	6	Personal Computer based E-Government	3 hrs	
	7	World Wide Web based E-Government	3 hrs	

	8	History and Evolution of E-Governance in India	3 hrs	
III	**E-Governance Technologies and Principles**		**12**	CO3
	9	Role of Technologies in E-Governance-Block Chain Technologies and E-Governance	2 hrs	
	10	Information Technology and E-Governance	2 hrs	
	11	Smart E-Government Platform through Technologies	1hr	
	12	Cloud Computing in E-Governance	1 hr	
	13	Core Principles of E-Governance	1 hr	
	14	E-Government is about Government rather than Online Presence	1hr	
	15	Promotion of E-citizens and E-democracy	1 hr	
	16	Accessibility, use of Open Source over proprietary software	1 hr	
	17	E-Business Plan, Strategies for Implementation of E-Governance, National E-Governance Plan	2 hrs	
IV	**E-Governance Architecture**		**12**	CO4
	18	E-Governance Architecture- India Enterprise Architecture (INDEA)- Vision, Purpose, Scope of INDEA	3 hrs	
	19	Structure, Principles, Reference Models of INDEA.	3 hrs	
	20	Opportunities, Challenges for E-Governance, Environmental and Social Challenges	2 hrs	
	21	Economical Challenges, Technical Challenges, Challenges of Implementation, Other Challenges, Security Drawbacks	2 hrs	
	22	Role of DeitY in good Governance	2 hrs	
V	**Flexi Module: E-Governance Initiatives in India**		**12**	CO5
	23	Empowering India through E-Governance- MyGov Platform, Pahal, Paygov India, Aadhar Enabled Payment System, Smart Cities	5 hrs	
	24	Nine Pillars of Digital India	2 hrs	
	25	UMANG, Digital Locker, National Centre of Geo-Informatics, Rapid Assessment System, State Wide Area Network, e-Kranti, e-Taal, e_District, e-Sampark, e-Pramaan- Digital Life Certificate, e-Office, Open Forge Platform	5 hrs	
Text Books	Books, Articles, Readings,	**Books:** 1. M Sumathy, A handbook of E-governance in India, Abhijeet Publishers, September 2021		

and Materials	Software, Websites, Tutorials	2. M P Gupta, Prabhat Kumar, Jaijit Bhattacharya, Government Online Opportunities and Challenges, Tata McGraw Hill, 2003 3. Prabhu C S R, E-GOVERNANCE: CONCEPTS AND CASE STUDIES, PHI, (Second Edition) 2022

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Outline concepts of E-Governance	U	PSO1, PSO2
CO2	Identify various phases of E-Government	Ap	PSO1, PSO2
CO3	Explain E-Governance Technologies and Principles	Ap	PSO1, PSO2
CO4	Identify E-Governance Architecture and challenges in E-Governance	Ap	PSO1, PSO2
CO5	Understand how the Nine Pillars of Digital India are important for improving governance and services for citizens.	U	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: E-Governance
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO.	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PSO1, PSO2	U	F, C	L	
CO2	PO1, PSO1, PSO2	Ap	F, C	L	
CO3	PO1, PSO1, PSO2	Ap	F, C	L	
CO4	PO1, PO2, PSO1, PSO2	Ap	F, C	L	
CO5	PO1, PO5, PSO4	U	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	2	-	-	-	-
CO 2	2	2	-	-	-	-
CO 3	2	2	-	-	-	-
CO 4	2	2	-	-	-	-
CO 5	-	-	-	-	1	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-
CO5	3	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓

CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC404.1**				
Course Title	**DESIGN THINKING AND PROBLEM SOLVING**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge acquisition capability, no prior expertise needed.				
Course Summary	Design Thinking and Problem Solving is a dynamic and interdisciplinary course that equips students with the mindset, tools, and methodologies to address complex challenges creatively. Grounded in the principles of human-centered design, this course explores how to identify, frame, and solve problems through a systematic and empathetic approach. Students will learn to embrace ambiguity, iterate rapidly, and collaborate effectively to generate innovative solutions that meet user needs and create meaningful impact.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction and Exploring Design Thinking**		**12**	CO1
	1	**Introduction to Design Thinking:** A primer on design thinking - Traditional approach, The new design thinking approach. Stages in Design Thinking: Empathize, Define, Ideate, Prototype, Test. Mindset for design thinking, Design thinking for product and process innovation,	7 hrs	

		Difference between engineering design and design thinking. Case Studies: General, Engineering and Service applications. Activities: Identify an Opportunity and Scope of the Project Explore the possibilities and Prepare design brief		
	2	**Methods and Tools for Empathize and Define phases:** Empathize - Methods of Empathize Phase: Stakeholder map, Empathy Map, Peer observation, Trend analysis Define - Methods of Define Phase: Storytelling, Critical items diagram, Define success Activities: Apply the methods of empathize and Define Phases Finalize the problem statement	5 hrs	
II	**Ideation and Prototyping in Design Thinking**		**12**	CO2
	3	**Methods and Tools for Ideate phase:** Ideate - Brainstorming, 2X2 matrix, 6-3-5 method, NABC method; Activities: Apply the methods of Ideate Phase: Generate lots of Ideas	5 hrs	
	4	**Methods and Tools for Prototype Phase:** Prototype - Types of prototypes - Methods of prototyping - Focused experiments, Exploration map, Minimum Viable Product; Activities: Apply the methods of Prototype Phase: Create prototypes for selected ideas	7 hrs	
III	**Testing and Implementation in Design Thinking**		**12**	CO3
	5	**Methods and Tools for Test Phase:** Test - Methods of Testing: Feedback capture grid, A/B testing Activities: Collect feedback; iterate and improve the ideas	5 hrs	
	6	**Solution Overview** - Create a Pitch - Plan for scaling up - Road map for implementation Activities: Present your solution using Storytelling method	7 hrs	
IV	**Creative Problem Solving: Approaches and Strategies**		**12**	CO4
	7	**Creative approaches to problem solving**: what is problem solving creative approaches for problem solving, **Understanding the challenge:** data stages, framing problem stages, generating	6 hrs	

		ideas		
	8	**Preparing for action:** Developing solution stages, action stage, planning your approaches, peoples as creative problem solvers,	6 hrs	
V	**Flexi Module:**		**12**	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Creative approaches to Problem Solving – A framework for Innovation and change		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Develop understanding of design thinking, methods and tools.	R, U	PSO2
CO2	Comprehend methods and tools for ideate phases, prototype phase.	R, U	PSO2
CO3	Review Methods and tools for test phases and solution overview.	E	PSO4
CO4	Creative approach for problem solving, prsoftweparing for actions and understand its challenges	R, U	PSO3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Design Thinking and Problem Solving

Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) / Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2	U	F	L	
CO2	PO1, PO2, PO5, PSO2	U	C	L	
CO3	PO1, PO5, PSO4	U	C	L	

CO4	PO2, PO5, PSO3	U	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	1	-	-	-	-
CO2	-	2	-	-	-	-
CO3	-		-	2	-	-
CO4	-		3	-	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	2	-	-
CO2	3	3	-	-	2	-	-
CO3	3	-	-	-	2	-	-
CO4	-	3	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar/ Workshop
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓			✓
CO2	✓			✓
CO3		✓		✓
CO4		✓		✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSCCSC405.1**				
Course Title	**RESEARCH METHODOLOGY**				
Type of Course	**DSC**				
Semester	**VII**				
Academic Level	**4** ·				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Nil				
Course Summary	The course Research Methodology provides an overview of research methodologies and techniques. It covers research motivation, objectives, and types, including descriptive, analytical, applied, fundamental, quantitative, qualitative, conceptual, and empirical research. Students learn about research formulation, literature review, research design, data collection, hypothesis development, data processing, reporting, and thesis writing. The Flexi Module explores environmental impacts, ethical issues, commercialization, copyright, intellectual property rights, and plagiarism. Through this course, students develop essential research skills and ethical practices.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Objectives and types of research**		**12**	CO1
	1	Motivation, objectives – Research Methods vs Methodology	3 hrs	
	2	Types of Research – Descriptive vs Analytical, Applied vs Fundamental, Quantitative vs Qualitative, Conceptual vs Empirical	3 hrs	
	3	Research Formulation – Defining and formulating the research problem, Selecting the problem, Necessity of defining the problem, Importance of literature review in defining a problem	3 hrs	
	4	Literature review, Critical literature review, Identifying gap areas from literature review	3 hrs	
II	**Research Design and methods**		**12**	CO2

	5	Research Design-Basic principles, need of research design, Features of good design, Important concepts relating to research design	3 hrs	
	6	Developing a research plan – Exploration, Description, Diagnosis, Experimentation	3 hrs	
	7	Data collection and analysis- Sources of data- primary, secondary, tertiary	3 hrs	
	8	Methods of data collection – Observation, Interview, Questionnaires, Schedule and some other methods, Sampling methods – Probability, non-probability samples	3 hrs	
III	**Data Processing Strategies and Hypothesis**		**12**	CO3
	9	Editing, Coding, Classification tabulation, Graphical representation	6 hrs	
	10	Hypothesis – meaning and importance of hypothesis, sources of hypothesis, Types of hypotheses, Development of working hypothesis	6 hrs	
IV	**Reporting and thesis writing**		**12**	CO4
	11	Structure and components of scientific reports, Types of report, technical reports and thesis	3 hrs	
	12	Different steps in the preparation – Layout, structure and language of typical reports	3 hrs	
	13	Illustrations and tables, Bibliography, referencing and footnotes	3 hrs	
	14	Oral presentation, Planning, Preparation, Practice, Making presentation, Use of visual aids	3 hrs	
V	**Flexi Module: Application of results and ethics**		**12**	CO5
	15	Environmental impacts – Ethical issues, Ethical committees	4 hrs	
	16	Commercialisation, copy right, royalty, intellectual property rights and patent law	4 hrs	
	17	Plagiarism, citations and acknowledgement.	4 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Bhanwar Lal Garg, Renu Kavdia, Sulochana Agarwal, and Umesh Kumar Agarwal, An Introduction to Research Methodology, RBSA Publishers, 2015. 2. C R Kothari, Research Methodology: Methods and Techniques, New Age International (P) Ltd. Publishers, Second Edition 2004. 3. Anil K Dhiman, and Suresh C Sinha, Research Methodology, Ess Ess Publications, 2008		

		4. Arlene Fink, Conducting Research Literature Reviews: From the Internet to Paper, Fifth Edition, Sage Publications, 2019. **5.** Barbara Gastel, and Robert A. Day, How to Write and Publish a Scientific Paper, Eighth Edition, Santa Barbara, California: Greenwood, 2016.		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the distinction between research methods and methodology and apply them effectively in their research projects.	U	PSO3, PSO6
CO2	Demonstrate competency in various methods of data collection, such as observation, interviews, questionnaires, schedules, and others, and apply them according to the research objectives.	Ap	PSO1, PSO6
CO3	Demonstrate proficiency in editing raw data, coding variables, classifying data into meaningful categories, and tabulating data for analysis.	Ap	PSO3, PSO4
CO4	Develop skills in the various steps involved in preparing scientific reports, including layout, structure, and language considerations.	Ap	PSO1, PSO6
CO5	Evaluate and apply ethical principles, understand environmental impacts, and navigate legal aspects such as copyright, intellectual property rights, and plagiarism in research and commercialization processes	Ap	PSO1, PSO2, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Research Methodology
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PSO3, PSO6	U	C	L	

CO2	PO2, PSO1, PSO6	Ap	P	L	
CO3	PO2, PSO3, PSO4	Ap	P	L	
CO4	PO5, PSO1, PSO6	Ap	P	L	
CO5	PO3, PO5, PSO1, PSO2, PSO6	Ap	M	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	3	-	-	3
CO2	3	-	-	-	-	3
CO3	-	-	3	3	-	
CO4	3	-	-	-	-	3
CO5	3	3	-	-	-	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-
CO3	-	3	-	-	-	-	-
CO4	-	-	-	-	3	-	-
CO5	-	-	3	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO5		✓		

Discipline Specific Elective (DSE) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK7DSECSC400.1**				
Course Title	**FUNDAMENTALS OF GEN AI AND WORKING WITH OPEN AI**				
Type of Course	**DSE**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of machine learning concepts, familiarity with neural networks,				
Course Summary	Comprehensive course covering Generative AI fundamentals, OpenAI technologies, future trends in generative models including DALL-E and GPT series.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Generative AI: From Concepts to OpenAI Technologies**		**9**	CO1
	1	Introduction to Generative AI: Definition and scope of generative AI - Significance of generative	6 hrs	

		AI in various industries - Evolution of AI: From Rule-Based to Generative Models – Applications of auto encoders - Generative Adversarial Networks (GAN) Architecture - Overview of Flow based models and their advantages - Applications of generative models in image generation and manipulation.		
	2	Understanding OpenAI: History and evolution of OpenAI as a research organization - OpenAI's Technologies: Overview of GPT (Generative Pre-trained Transformer) models and their capabilities.	3 hrs	
II	**Future Trends in Generative Models**		**9**	CO2
	3	DALL-E applications in image generation - Limitations of current generative models in capturing complex data distributions - Future Trends - Exploration of reinforcement learning based generative models and their potential - Autoencoder Architecture - Explanation of the encoder and decoder architecture in autoencoders – Training Autoencoders: Overview of the backpropagation algorithm for training autoencoders. VAEs: Explanation of the probabilistic nature of VAEs and the role of the latent space.	9 hrs	
III	**Understanding GANs and Text Generation**		**9**	CO3
	4	Definition – Architecture - Training GANs: Overview of the minimax game framework used for training GANs – High resolution GAN training. Self-Attention GANs (SAGANs): Introduction to self-attention mechanisms and their integration into GAN architectures.	6 hrs	
	5	Introduction to Text Generation: language modeling, text completion, and dialogue generation.	3 hrs	
IV	**Exploring the GPT Series**		**9**	CO4
	6	GPT Evolution from GPT-1 to GPT4 - including model size, training data, and performance metrics. Impact of each GPT model – GPT Architecture - Techniques for fine-tuning pre-	4 hrs	

		trained GPT models - sentiment analysis, question answering, and text summarization.		
	7	Open AI's Generative Pre- Trained Transformers(Chat GPT, ElectroNeek, Canva, Zapier, EinsteinGPT, Google Bard, LSTMs and others) – Role of prompting in AI model – designing effective prompt.	5 hrs	
V	**Flexi Module: Introduction to DALL-E**		**9**	CO5
	8	DALL-E role in Image generation – Architecture - DALL-E Training: Data Collection, Preprocessing, and Model Optimization - Overview of the text-to-image synthesis process - Limitations and Challenges of DALL-E – Applications – Prompting: Principles – Prompt for specific domains - Prompt Generation Strategies - Prompting with an Image - Mets Prompting.	9 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Generative Artificial Intelligence for Beginners, by Gwen Taylor, Vibrant Publisher, 2024. 2. Generative Deep Learning, 2nd Edition, David Foster, O'Reilly Media, Inc, 2023 3. Modern Generative AI with ChatGPT and OpenAI Models, Valentina Alto, Packt Publishing, 2023. 4. Mastering GPT-4: A Comprehensive Guide to Harnessing the Power of AI, Saif Hussaini, 2023.		
Lab Exercises			**30**	CO6
1. Write the code to implement a basic Variational Autoencoder. Use a dataset like MNIST for training and testing. 2. Develop and train a Generative Adversarial Network on a dataset of your choice. Observe and report the changes in generated images over epochs. 3. Perform and visualize interpolation between two points in the latent space of a trained VAE. 4. Use a trained VAE to identify anomalies in a dataset 5. Implement a style transfer using a pre-trained GAN. Transfer the style of one image to another and discuss the results. 6. Implement a Conditional Generative Adversarial Network (CGAN). Use labels or additional information to conditionally generate images. 7. Create a model that translates images from one domain to another (e.g., grayscale to color, satellite images to maps).			30 hrs	

8. Explore text-to-image synthesis using techniques like StackGAN or AttnGAN. Generate images based on textual descriptions. 9. GAN model using TensorFlow or PyTorch 10. Generating images using DALL-E 11. Conditioning DALL-E to generate images		

Prompt Engineering

Exercise 12	**Convert ungrammatical statements into standard English.**	
	Prompt	
	SYSTEM	You will be provided with statements, and your task is to convert them to standard English.
	User	She no went to the market.
	Sample response	She did not go to the market.
Exercise 13	Create tables from unstructured text.	
	Prompt	
	SYSTEM	You will be provided with unstructured data, and your task is to parse it into CSV format.
	User	There are many fruits that were found on the recently discovered planet Goocrux. There are neoskizzles that grow there, which are purple and taste like candy. There are also loheckles, which are a grayish blue fruit and are very tart, a little bit like a lemon. Pounits are a bright green color and are more savory than sweet. There are also plenty of loopnovas which are a neon pink flavor and taste like cotton candy. Finally, there are fruits called glowls, which have a very sour and bitter taste which is acidic and caustic, and a pale orange tinge to them.
	Sample response	Fruit,Color,Taste neoskizzles,purple,candy loheckles,grayish blue,tart pounits,bright green,savory loopnovas,neon pink,cotton candy glowls,pale orange,sour and bitter
Exercise 14	Detect sentiment in a tweet.	
	Prompt	

	SYSTEM	You will be provided with a tweet, and your task is to classify its sentiment as positive, neutral, or negative.
	User	I loved the new Mohanlal movie!
	Sample response	Positive

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discover the Fundamentals of Generative AI and OpenAI's Innovations	U	PSO2
CO2	Excell in Generative Models and Explore Future Trends in Reinforcement Learning.	Ap	PSO5
CO3	Investigate GANs, Text Generation, and Advancing Architectures.	An	PSO3, PSO6
CO4	Map the Evolution and Applications of GPT Models.	U	PSO2, PSO5
CO5	Leverage DALL-E for Image Synthesis and Innovative Prompting Techniques.	E	PSO3, PSO5
CO6	Learn to create and experiment with different types of AI models to generate images and translate text into images, using tools like VAEs, GANs, CGANs, and DALL-E.	C	PSO3, PSO4, PSO5, PSO6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Fundamentals of Gen AI and working with Open AI
Credits: 3:0:1(Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial(T)	Practical (P)
CO1	PO1, PO6, PSO2	U	C	L	
CO2	PO1, PO2, PO6, PSO5	Ap	C	L	

CO3	PO1, PO2, PO6, PSO3, PSO6	An	C	L	
CO4	PO1, PO2, PO6, PSO2, PSO5	U	C	L	
CO5	PO1,PO2, PSO3, PSO5	E	C	L	
CO6	PO1, PO2, PSO3, PSO4, PSO5, PSO6	C	P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	3	-	2	-	-
CO2	-	-	-	-	3	2
CO3	-	2	3	-	2	1
CO4	-	3	-	-	1	-
CO5	-	-	3	-	2	1
CO6	-	1	2	3	3	3

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	3	-
CO2	3	3	-	-	-	3	-
CO3	3	3	-	-	-	3	-
CO4	3	3	-	-	-	3	-
CO5	3	3	-	-	-	-	-
CO6	3	3	-	-	-	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIC451.1DSECS**				
Course Title	**EMERGING TRENDS IN WEB DEVELOPMENT**				
Type of Course	**DSE**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge of HTML, CSS, and JavaScript. Familiarity with web development concepts and experience with programming will be beneficial for understanding and implementing advanced topics such as WebVR, RTC, PWAs, WASM, and web performance optimization.				
Course Summary	This course covers emerging trends in web development, including WebVR, Real-Time Communication (RTC), Progressive Web Apps				

	(PWA), WebAssembly (WASM), and Web Performance Optimization. Participants will learn to create immersive VR experiences, build real-time chat and video conferencing applications, develop PWAs with offline capabilities and push notifications, integrate WebAssembly into web applications, and optimize web performance for improved user experience and SEO.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Emerging Trends**		**9**	CO1
	1	Introduction to Emerging Trends: Overview of emerging trends in web development, Importance of staying updated with industry advancements, Introduction to Web VR, RTC, PWA, WASM, and Web Performance Optimization, Integrating VR content into web applications.	2 hrs	
	2	Web VR (Virtual Reality): Understanding Virtual Reality (VR) concepts and applications, Introduction to WebVR and its capabilities, Building VR experiences with A-Frame and Three.js	7 hrs	
II	**Real-Time Communication (RTC)**		**9**	CO2
	3	Real-Time Communication (RTC): Exploring real-time communication protocols (WebSockets, WebRTC), Building real-time chat applications, Implementing video conferencing using WebRTC, Handling security considerations in RTC applications for performance and user experience	5 hrs	
	4	Progressive Web Apps (PWA): Introduction to Progressive Web Apps (PWAs) and their benefits, Building PWAs with service workers, Implementing offline capabilities and push notifications, Optimizing PWAs	4 hrs	
III	**WebAssembly (WASM)**		**9**	CO3
	5	Understanding WebAssembly and its purpose, Compiling and running code in WebAssembly, Integrating WebAssembly with JavaScript and existing web applications, Performance benchmarks and comparisons with traditional web development approaches	9 hrs	

<table>
<tr><td rowspan="2">IV</td><td colspan="2">Web Performance Optimization</td><td>9</td><td rowspan="2"></td></tr>
<tr><td>6</td><td>Importance of web performance optimization for user experience and SEO, Techniques for optimizing web performance (code minification, lazy loading, image optimization), Tools and best practices for measuring and analyzing web performance, Implementing performance optimization strategies in real-world web projects</td><td>9 hrs</td><td>CO4</td></tr>
<tr><td rowspan="2">V</td><td colspan="2">Flexi Module:</td><td>9</td><td rowspan="2"></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Text Books and Materials</td><td>Books, Articles, Readings, Software, Websites, Tutorials</td><td colspan="3">Websites:
Web VR (Virtual Reality):
1. A-Frame Documentation: https://aframe.io/docs/
2. Three.js Documentation: https://threejs.org/docs/
3. Mozilla WebVR Documentation: https://developer.mozilla.org/en-US/docs/Web/API/WebVR_API
Real-Time Communication (RTC):
1. WebSockets Documentation: https://developer.mozilla.org/en-US/docs/Web/API/WebSockets_API
2. WebRTC Documentation: https://developer.mozilla.org/en-US/docs/Web/API/WebRTC_API
Progressive Web Apps (PWA):
1. Google Developers PWA Documentation: https://developers.google.com/web/progressive-web-apps
2. Mozilla MDN PWA Documentation: https://developer.mozilla.org/en-US/docs/Web/Progressive_web_apps
WebAssembly (WASM):
1. WebAssembly Official Site: https://webassembly.org/
2. MDN WebAssembly Documentation: https://developer.mozilla.org/en-US/docs/WebAssembly
Web Performance Optimization:
1. Google Developers Web Fundamentals: https://developers.google.com/web/fundamentals
2. Web.dev Performance Documentation: https://web.dev/performance/</td></tr>
</table>

		3. MDN Web Performance Documentation: https://developer.mozilla.org/en-US/docs/Web/Performance		
Lab Exercises			**30**	
1. Build a simple VR experience using A-Frame or Three.js. 2. Create a real-time chat application using plain WebSocket API. 3. Convert a basic website into a PWA with service workers. 4. Compile a simple program to WebAssembly and integrate it into a web application. 5. Optimize the performance of a web page using techniques like code minification, lazy loading, and image optimization. 6. Enhance a web application by integrating VR content using WebVR. 7. Develop a video conferencing application using WebRTC.			30 hrs	CO5

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Create VR experiences using A-Frame and Three.js	C	PSO4, PSO5
CO2	Apply real-time communication protocols and Progressive Web App development.	Ap	PSO4, PSO5
CO3	Apply WebAssembly and web performance optimization.	Ap	PSO2, PSO4
CO4	Implement effective web performance optimization strategies, including code minification, lazy loading, and image optimization.	An	PSO2, PSO4
CO5	Build immersive VR experiences, real-time communication applications, PWAs, integrate WebAssembly, optimize web performance, integrate VR content, and develop video conferencing applications.	C	PSO4, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Emerging Trends in Web Development
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO4, PSO5	C	C, P	L	
CO2	PO1, PO2, PSO4, PSO5	Ap	C, P	L	
CO3	PO1, PO2, PSO2, PSO4	Ap	C, P	L	
CO4	PO1, PO2, PO5, PSO2, PSO4	An	C, P	L	
CO5	PO1, PO2, PO5, PO6, PSO4, PSO5	C	C, P		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	-	-	3	3	-
CO2	-	-	-	3	3	-
CO3	-	2	-	3	-	-
CO4	-	3	-	3	-	-
CO5	-	-	-	3	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	-	2	-	-
CO2	2	2	-	-	-	-	-
CO3	2	2	-	-	-	-	-
CO4	2	2	-	-	2	-	-
CO5	2	2	-	-	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓			✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIC402.1DSECS**				
Course Title	**COMPUTER VISION**				
Type of Course	**DSE**				
Semester	**VII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Image Processing Fundamentals and Linear Algebra				
Course Summary	The Computer Vision course teaches how computers can understand and interpret images like humans. It starts by explaining how images are represented digitally and the basics of colour in images. Students learn about transforming images, like making them brighter or changing their colours. They also learn about techniques to improve image quality, like removing noise. The course covers how computers can identify objects in images through techniques like segmentation and feature extraction. Students also learn about recognizing shapes and patterns in images, tracking objects and analyzing motion in videos. Overall, the course				

	provides a foundation for understanding and processing images for various applications, including robotics and artificial intelligence.

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Image Processing fundamentals**		**12**	CO1
	1	Image Representation and Properties, Image Digitization and Properties. Elements of digital image processing system, Image Sampling, Quantization representing digital images, spatial and intensity resolution, image interpolation, Relationship between pixels-neighbours of a pixel, adjacency, connectivity, regions and boundaries, colour image processing, RGB, HSI colour models.	12 hrs	
II	**Advanced Image Processing Techniques**		**12**	CO2
	2	**Intensity Transformation functions:** Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation, Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution.	4 hrs	
	3	**Discrete Fourier Transform** - Image Pre-Processing in Spatial and Frequency Domain: Pixel Brightness Transformation - Geometric Transformations - Local Preprocessing - Image Smoothing – Edge Detectors - Corner Detectors - Image Restoration.	4 hrs	
	4	**Image Segmentation:** Thresholding – Edge-Based Segmentation – Region Based Segmentation, Mean shift segmentation, Graph cut algorithm– Matching – Evaluation Issues in Segmentation, Watersheds.	4 hrs	
	Advanced Color Image Processing and Analysis		**12**	CO3
III	5	**Color Image Processing:** Color Fundamentals – Color Models – Pseudocolor Image Processing – Basics of Full Color Image Processing – Color Transformations – Smoothing and Sharpening – Color Segmentation – Noise in Color Images.	3 hrs	

	6	**Image Morphology:** Binary and gray scale Morphological analysis - Dilation and Erosion - Skeletons and Object Marking – Granulometry, Morphological Segmentation.	3 hrs	
	7	**Feature extraction:** Global image measurement, feature-specific measurement, characterizing shapes, Hough Transform.	3 hrs	
	8	**Representation and Description:** Region Identification – Contour and Region Based Shape Representation and Description – Shape Classes. Flexible shape extraction: active contours, Flexible shape models: active shape and active appearance. Texture representation and analysis: Statistical Texture Description – Syntactic, Hybrid Texture description Methods, Applications.	3 hrs	
IV	**Advanced Topics in Image Understanding and Compression**		**12**	CO4
	9	**Image Understanding:** Control Strategies – RANSAC – Point Distribution Models – Scene Labeling and Constraint Propagation.	3 hrs	
	10	**Image Data Compression:** Predictive Compression Methods – Vector Quantization, DCT, Wavelet, JPEG.	3 hrs	
	11	**Image Formation:** Geometric image formation, Photometric image formation - Camera Models and Calibration: Camera Projection Models – Orthographic, Affine, Perspective, Projective models. Projective Geometry, Transformation of 2D and 3D.	6 hrs	
V	**Flexi Module:** **Object Recognition and Tracking Techniques**		**12**	CO5
	12	**Object Recognition:** Shape Correspondence and Shape Matching, PCA, Shape Priors for Recognition, Finding Templates and Recognition, Recognition by Relations between Templates, Robotic vision, Computer Vision on the GPU.	6 hrs	

	13	**Tracking & Video Analysis:** Tracking and Motion Understanding - Kalman filters, condensation, particle, Bayesian filters, Hidden Markov models, Change detection and Model-based tracking.	6 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011. 2. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011. 3. Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998. 4. John F. Hughes, Andries Van Dam, Morgan Mc Guire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, ”Computer Graphics: Principles and Practice”, , 3rd Edition, Addison- Wesley Professional,2013. 5. Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007 6. Amarendra N Sinha and Arun D Udai, Computer Graphics, McGraw Hill publications		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO Addressed
CO1	Understand the basic concepts of digital images	R, U	PSO2
CO2	Apply advanced image processing techniques such as intensity transformation, discrete Fourier transform, and image segmentation	Ap	PSO4
CO3	Develop expertise in colour image processing, including understanding colour fundamentals and colour models.	Ap, An	PSO2
CO4	Gain proficiency in image understanding techniques, including control strategies and point distribution models.	U, Ap	PSO5
CO5	Develop expertise in object recognition techniques and tracking and video analysis	U, Ap	PSO4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Computer Vision
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO6, PSO2	R, U	C	L	
CO2	PO1, PO6, PSO4	Ap	P	L	
CO3	PO1, PO6, PSO2	Ap, An	C, P	L	
CO4	PO1,PO2, PSO5	U, Ap	P	L	
CO5	PO1, PO2, PO5, PSO4	U, Ap	C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	3	-	-	-	-
CO 2	-	-	-	2	-	-
CO 3	-	3	-	-	-	-
CO 4	-	-	-		2	-
CO 5	-	-	-	1	-	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	-	-	2	-
CO2	3	-	-	-	-	2	-
CO3	3	-	-	-	-	2	-
CO4	3	2	-	-	-	-	-
CO5	3	2	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam

- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Semester VIII

Discipline Specific Core (DSC) Courses

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK8DSCCSC450.1**				
Course Title	**ROBOTICS**				
Type of Course	**DSC**				
Semester	**VIII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge of mathematics and electronics				
Course Summary	Provides a comprehensive understanding of robotics, including fundamentals, kinematics, dynamics, sensors, robot vision, AI applications in robotics, and humanoid robots.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Fundamentals of Robotics**		**12**	CO1
	1	Fundamentals of Robotics - evolution of robotics (from early automata to modern robots) - Classification of robots (industrial, service, mobile, special purpose) - Robot anatomy - work cell – Introduction to Robot Programming languages.	12 hrs	
II	**Kinematics, Dynamics, and Sensors**		**12**	CO2
	2	Mathematical representation of Robots- Position and orientation– Homogeneous transformation Various joints- Representation using the Denavit Hattenberg parameters- Degrees of freedom-Direct kinematics- Inverse kinematics- SCARA robots- Solvability– Solution methods-Closed form solution.	9 hrs	

	3	Types of sensors used in robotics: proximity sensors, vision systems, IMUs	3 hrs	
III	**Robot Vision**		**12**	CO3
	4	Basic introduction to Robotic operating System (ROS)- Real and Simulated Robots- Introduction to OpenCV, Open NI and PCL, installing and testing ROS camera Drivers, ROS to OpenCV- The cv_bridge Package.	12 hrs	
IV	**AI in Robotics**		**12**	CO4
	5	Robotic perception, localization, mapping-configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.	12 hrs	
V	**Flexi Module: Humanoids**		**12**	CO5
	6	Wheeled and legged, Legged locomotion and balance, Arm movement, Gaze and auditory orientation control, Facial expression, Hands and manipulation, Sound and speech generation, Motion capture/Learning from demonstration, Human activity recognition using vision, touch, sound, Vision, Tactile Sensing, Models of emotion and motivation. Performance, Interaction, Safety and robustness, Applications, Case studies.	12 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Introduction to Autonomous Robots by Nikolaus Correll, Bradley Hayes, et al., CRC Press, 2019. 2. Robotics: Modelling, Planning and Control by Bruno Siciliano, Lorenzo Sciavicco, et al., Springer, 2009. 3. Probabilistic Robotics by Sebastian Thrun, Wolfram Burgard, et al., The MIT Press, 2005. 4. Robot Operating System (ROS): The Complete Reference (Volume 7), Anis Koubaa, Springer Nature, 2023. 5. Learning Robotics using Python - Second Edition, Lentin Joseph, Packt Publishing, 2018 6. Robot Mechanisms and Mechanical Devices Illustrated" by Paul E. Sandin, Oscar U. Nwakudu, McGraw-Hill Education, 2003. 7. Humanoid Robotics: A Reference" by Nikolaus Correll, Bradley Hayes, et al., CRC Press, 2018. 8. Artificial Intelligence for Robotics and Autonomous Systems Applications, Ahmad Taher Azar, Anis Koubaa, Springer, 2023. 9. Introduction to AI Robotics" by Robin R. Murphy, The MIT Press, 2019.		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discover the world of robots and their functionalities	R	PSO2, PSO5
CO2	Grasp the principles of robot movement and sensory perception.	U	PSO2, PSO3, PSO4
CO3	Acquire skills in using ROS and OpenCV for robot vision.	Ap	PSO4, PSO5
CO4	Understand the application of AI in enhancing robotic capabilities.	An	PSO2, PSO3, PSO5, PSO6
CO5	Explore the fascinating field of humanoid robots and their interactions.	E	PSO2, PSO3, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Robotics
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2, PSO5	R	F, C	L	
CO2	PO1,PO5, PSO2, PSO3, PSO4	U	C, P	L	
CO3	PO1,PO6,PSO4, PSO5	Ap	P	L	
CO4	PO1, PO5, PSO2, PSO3, PSO5, PSO6	An	C, M	L	
CO5	PO1, PO2,PO5, PSO2, PSO3, PSO5	E	C, M	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	-	2	-	1	2	-
CO2	-	3	1	2	-	-
CO3	-	-	-	2	3	-
CO4	-	2	2	-	1	2
CO5	-	1	2	-	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	-	2	-	-
CO2	2	-	-	-	2	-	-
CO3	3	-	-	-	-	3	-
CO4	3	-	-	-	3	-	-
CO5	3	3	-	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK8DSCCSC451.1**				
Course Title	**RUBY ON RAILS**				
Type of Course	**DSC**				
Semester	**VIII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of programming concepts and familiarity with any programming language. Knowledge of web development concepts is beneficial but not mandatory.				
Course Summary	Provides a comprehensive introduction to Ruby and Rails, covering object-oriented programming, MVC architecture, data structures, and AWS deployment.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I		**Ruby Fundamentals**	**9**	CO1
	1	Introduction to Ruby - Installing Ruby with RVM – Installation of software (RVM, Rails, GIT, MySQL, Ruby, Sublime) – RVM commands - Creating script in Ruby - Ruby and Object orientation – Interactive Ruby – Objects and classes – Kernel methods - Passing Data to methods.	9 hrs	
II		**Ruby's Building Blocks**	**9**	CO2
	2	Basic expressions – variables – comparison operators and expression – Looping through numbers with blocks and iterators – floating point numbers – Constant – Text and Strings – Regular Expression and String Manipulation – Arrays – Hashes - Flow control – if and unless – ternary operator – elsif and case – while and until – Dates and Times – ranges – symbols.	9 hrs	
III		**The Core of Ruby and Rails Installation**	**9**	CO3

	3	Object Orientation Basics – local, global, object and class variables – Inheritance – Overriding – Nested classes – Scope of constants.	5 hrs	
	4	Rails Installation – full stack framework – Convention over Configuration (COC) – Ruby Gems – Gem commands.	4 hrs	
IV	**Models and Forms**		**9**	CO4
	5	MVC architecture – defining models – generating models – Rails forms vs HTML forms – connecting form to a model – creating view – adding dynamic data – model validations – adding basic validation – adding error messages.	9 hrs	
V	**Flexi Module: Advanced Models**		**9**	CO5
	6	Built-in model methods – adding methods to models – Model relationships.	3 hrs	
	7	Rails Asset pipeline – Adding CSS – Adding JavaScript.	3 hrs	
	8	Managing Ruby environments – setting up an AWS account.	3 hrs	
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Beginning Ruby 3: From Beginner to Pro, Carleton DiLeo, Peter Cooper, Apress, 2020. 2. Ruby on Rails – seventh edition, Michael Hartl, Pearson, 2022. 3. Layered Design for Ruby on Rails Application, Vladimir Dementyev, Packt Publishers, 2023.		

Lab Exercises	**30**	
1. Write a Ruby program to calculate the factorial of a number using a loop. 2. Create a Ruby script that takes a string as input and uses regular expressions to count the number of vowels in the string. 3. Write a Ruby program that uses the case statement to implement a basic calculator (addition, subtraction, multiplication, division). 4. Create a Ruby program that demonstrates the use of inheritance and method overriding. 5. Install Rails using Ruby Gems and verify the installation. 6. Write a Ruby program that demonstrates the use of global, local, object, and class variables. 7. Create a Rails application that uses MVC architecture to display a list of students. 8. Add a form to the application to add new students to the list. 9. Implement basic validation for the form fields and display error messages.	30 hrs	CO6

10. Add a method to the Student model in your Rails application that calculates the average age of all students. 11. Use the Rails Asset Pipeline to add custom CSS and JavaScript to your application. 12. Set up an AWS account and familiarize yourself with the AWS Management Console.		

Course Outcomes

CO	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Learn to install Ruby and write basic scripts.	R, Ap	PSO1, PSO4
CO2	Understand Ruby's basic expressions, variables, and data types.	U, An	PSO2
CO3	Learn about object orientation in Ruby and how to install Rails.	U, R, Ap	PSO2
CO4	Understand how to create and connect models, views, and forms in Rails.	U, An, C	PSO3
CO5	Learn about model methods, Rails Asset pipeline, and setting up an AWS account.	U, R, Ap	PSO4
CO6	Gain practical experience in Ruby and Rails by implementing object-oriented programming concepts, creating MVC architecture, manipulating data structures, and deploying applications.	Ap, An, E, C	PSO1, PSO5

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Ruby on Rails
Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PSO1, PSO4	R, Ap	F, P	L	
CO2	PO1, PO6, PSO2	U, An	C	L	
CO3	PO1, PO6, PSO2	U, R, Ap	C, P	L	

CO4	PO1, PO6, PSO3	U, An, C	C, P	L	
CO5	PO1, PO6, PSO4	U, R, Ap	C, P	L	
CO6	PO1, PO2, PO6, PSO1, PSO5	Ap, An, E, C	P, M		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	-	-	1	-	-
CO2	-	3	-	-	-	-
CO3	-	2	-	-	-	-
CO4	-	-	3	-	-	-
CO5	-	-	-	2	-	-
CO 6	3	-	-	-	3	-

Mapping of COs with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	3	-	-	-	-	3	-
CO3	3	-	-	-	-	3	-
CO4	3	-	-	-	-	3	-
CO5	3	-	-	-	-	3	-
CO6	3	3	-	-	-	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		
CO 6	✓			✓

.

Mar Ivanios College (Autonomous)

Discipline	**COMPUTER SCIENCE**				
Course Code	**MIUK8DSCCSC452.1**				
Course Title	**EDGE COMPUTING**				
Type of Course	**DSC**				
Semester	**VIII**				
Academic Level	**4**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	1. Networking. 2. Operating System concepts.				
Course Summary	The course introduces students to edge computing, an important branch of distributed computing and IoT with significant applications in Data Science.				

Detailed Syllabus:

Module	Unit	Content	Hrs	CO
I	**Introduction to Edge Computing**		**12**	CO1
	1	Edge purpose and definition, Edge hardware architectures, Operating systems, Hierarchy of Fog and Edge Computing, Business Models, Edge Computing Platforms Edge	12 hrs	

		Routing and Networking, Edge to Cloud Protocols. Opportunities and Challenges		
II	**Edge Computing Architecture**		**12**	CO2
	2	Edge computing architectures and deployment models - distinction between edge, fog, and cloud layers, edge clouds, mobile edge computing (MEC), and industrial edge computing; Edge devices and sensors for data collection- GPU , TPU based hardware accelerators.	12 hrs	
III	**Edge Data Collection and Pre-processing**		**12**	CO3
	3	Data collection techniques at the edge (e.g., IoT devices, sensors) Edge data preprocessing and filtering algorithms, Data compression and aggregation techniques for resource-constrained devices, Edge-based data cleaning and quality assurance, Edge data integration and synchronization with cloud or central servers.	12 hrs	
IV	**Edge Data Analytics**		**12**	CO4
	4	Role of Edge Data Analytics in real-time decision-making; Challenges and opportunities in Edge Data Analytics, Machine learning algorithms for edge data analysis (e.g., classification, regression,) Statistical analysis methods for real-time data streams, Edge-based anomaly detection and outlier identification, Time-series analysis and forecasting at the edge, Distributed and parallel computing techniques for edge analytics.	12 hrs	
V	**Flexi Module:** **Edge Data Visualization and Security**		**12**	CO5
		Visualization techniques for edge data analytics, Real-time dashboards and data monitoring at the edge Visualization of streaming data from multiple edge devices, Interactive visualization tools for edge analytics, Security challenges in edge data analytics, Secure communication protocols	12 hrs	

		for edge devices, Privacy-preserving techniques for edge data collection and analysis Access control and authentication in edge computing environments, Legal and ethical considerations in edge data analytics.		
Text Books and Materials	Books, Articles, Readings, Software, Websites, Tutorials	**Books:** 1. Perry Lea, IoT and Edge Computing for Architects Implementing edge and IoT systems from sensors to clouds with communication systems, analytics, and security, 2nd Edition ,Packt Publishing, 2020. 2. Edge Analytics: A Comprehensive Guide for Internet of Things Data Analytics" by Satyajit Das and Taposh Dutta Roy (Published in 2018) 2."Edge Analytics in the Internet of Things: A Hands-on Introduction with Raspberry Pi and Edge Computing" by Madhura Jayaratna (Published in 2020) 3. Edge Analytics for Internet of Things: A Comprehensive Guide to Building Intelligent IoT Solutions" by Kaushik Das (Published in 2019) 4."Edge Computing for Data Analytics: Achieve Local Analytics and AI on Edge Devices" by Chi Harold Liu (Published in 2021) 4. Practical Industrial Internet of Things Security: A practitioner's guide to securing connected industries and supply chains" by Sravani Bhattacharjee, Debashis De, and Mohammad Saiful Islam (Published in 2022)		

Course Outcomes

CO	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the basic concepts of Edge Computing.	U	PSO2
CO2	Able to understand edge Computing architecture	U	PSO2
CO3	Develop an understanding of data collection methods and preprocessing techniques specifically designed for edge devices	An	PSO3
CO4	Perform real-time analytics for edge devices	Ap	PSO5
CO5	Learn techniques to optimize edge data analytics and able to analyze the security and privacy challenges associated with edge data analytics	An	PSO3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Edge Computing
Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	PO1, PO5, PSO2	U	C	L	
CO2	PO1, PO5, PSO2	U	C	L	
CO3	PO1, PO5, PSO3	An	P	L	
CO4	PO1, PO2, PO5, PSO5	Ap	P	L	
CO5	PO1, PO5, PSO3	An	P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	-	2	-	-	-	-
CO 2	-	3	-	-	-	-
CO 3	-	-	2	-	-	-
CO 4	-	-	-	-	2	-
CO 5	-	-	2	-	-	-

Mapping of COs with POs:

		PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1		2	-	-	-	2	-	-
CO 2		2	-	-	-	2	-	-
CO 3		2	-	-	-	2	-	-
CO 4		3	3	-	-	3	-	-
CO 5		3	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5		✓		

Field Trip/Study Tour

The 3 Year/4 Year UG Programme in Computer Science at Mar Ivanios College (Autonomous) includes a unique field trip designed to reinforce the principles of secularism and oneness, while also providing practical exposure to computer science applications. This trip will be carefully planned to visit an organization where students can observe and learn from real-world implementations of computational theories and practices. The goal is to cultivate an appreciation for cultural diversity and unity, while simultaneously deepening students' knowledge of software development.The number of days for the field trip/study tour will be decided by the Principal in consultation with the BoS and the College Council.

MAR IVANIOS COLLEGE (AUTONOMOUS), THIRUVANANTHAPURAM
BOARD OF STUDIES IN COMPUTER SCIENCE, 2023 – 2026

Sl. No.	Name	Designation
1.	**Prof. (Dr.) Gladston Raj S.** (Chairman)	Professor Department of Computer Science Govt. College, Kariavattom Thiruvananthapuram
2.	**Dr. Priya R** (University Nominee)	Assistant Professor Department of Computer Science Govt College Kariavattom
3.	**Dr.Tina Elizabeth Mathew**	Associate Professor & Head Dept. of Computer Science Govt College Karaivattom Thiruvananthapuram
4.	**Prof. (Dr.) Sajimon Abraham**	Professor School of Management and Business Studies Mahatma Gandhi University Kottayam
5.	**Dr. Juby George K**	Assistant Professor Department of Computer Applications Marian College(Autonomous) Kuttikkanam
6.	**Dr Rajeev R.R.**	Head, E-Governance & Development ICFOSS, Trivandrum
7.	**Dr.Bindulal T S**	Assistant Professor Department of Computer Science Government College, Nedumnagad
8.	**Dr. Malu G**	Assistant Professor Digital University, Kerala

9.	**Ms. Stephy Joseph**	Senior Project Engineer CDAC, Technopark
10.	**Ms. Ashia Mol Thomas**	Lead 1 Cloud Infrastructure Management, UST, Trivandrum
11.	**Ms. Tinu C Philip**	Assistant Professor & Head Department of Computer Science Mar Ivanios College(Autonomous) Trivandrum
12.	**Ms. Jisha Isaac**	Assistant Professor, Department of Computer Science Mar Ivanios College(Autonomous) Trivandrum
13.	**Dr. Resmi V**	Assistant Professor, Department of Computer Science Mar Ivanios College(Autonomous) Trivandrum
14.	**Dr. Anitha K L**	Assistant Professor, Department of Computer Science Mar Ivanios College(Autonomous) Trivandrum
15.	**Mr. Vinodh M R**	Assistant Professor, Department of Computer Science Mar Ivanios College(Autonomous) Trivandrum