Doc. 300.1.2

07.14.318.008.001

Higher Education Institution's Response

E-learning programme of study

Date: 13/06/2022

- **Higher Education Institution:** Frederick University
- **Campus:** Nicosia
- **School:** Engineering
- **Department / Sector:** Department of Electrical Engineering, Computer Engineering and Informatics
- **Programme(s) of study under evaluation Name (Duration, ECTS, Cycle)**

In Greek: Διαδικτυακά και Έξυπνα Συστήματα (3 ακαδημαϊκά εξάμηνα, 90 ECTS, Master (MSc)

In English: Web and Smart Systems (3 academic semesters, 90 ECTS, Master (MSc))

Language(s) of instruction: English

Programme's Status: New

The present document has been prepared within the framework of the authority and competencies of the Cyprus Agency of Quality Assurance and Accreditation in Higher Education, according to the provisions of the "Quality Assurance and Accreditation of Higher Education and the Establishment and Operation of an Agency on Related Matters Laws of 2015 to 2019" [N. 136 (I)/2015 to N. 35(I)/2019].

A. Guidelines on content and structure of the report

- *The Higher Education Institution (HEI) based on the External Evaluation Committee's (EEC's) evaluation report (Doc.300.3.1) must justify whether actions have been taken in improving the quality of the department in each assessment area.*

- *In particular, under each assessment area, the HEI must respond on, without changing the format of the report:*

    - *the findings, strengths, areas of improvement and recommendations of the EEC*
    - *the deficiencies noted under the quality indicators (criteria)*
    - *the conclusions and final remarks noted by the EEC*

- *The HEI's response must follow below the EEC's comments, which must be copied from the external evaluation report (Doc. 300.3.1).*

- *In case of annexes, those should be attached and sent on a separate document.*

1. **Study programme and study programme's design and development** *(ESG 1.1, 1.2, 1.7, 1.8, 1.9)*

Sub-area		*Non-compliant/ Partially Compliant/Compliant*
1.1	Policy for quality assurance	Compliant
1.2	Design, approval, on-going monitoring and review	Partially compliant
1.3	Public information	Compliant
1.4	Information management	Compliant

Areas of improvement and recommendations

1.a.	Consider giving the students taking the Master (e-learning mode) the possibility to select either the specialisation in Web Design or in Smart System, same as for the students of the in-presence Master.

We accept and adopt the recommendation by the External Evaluation Committee. The students taking the Master on Web Smart Systems e-learning mode will have the opportunity to select a specialization between (a) Web Systems or (b) Smart Systems.

The revised programme structure is attached in Annex 1 – Programme Structure.

1.b.	Consider including at least one representative from industry in the Internal Quality Committee, to ensure that the needs of the industry are kept into consideration and regularly updated.

As per the University's charter, the Internal Quality Assurance is comprised by the Vice Rector of Academic Affairs, one (1) Teaching and Research Staff representative from each School of the University, two (2) Teaching and Research Staff members with speciazilation in Quality Assurance, one (1) Administrative Staff representative and two (2) representatives from the student body (one (1) undergraduate and one (1) postgraduate). At the Departmental level, there is the Advisory board where two (2) industry professionals participate, offering their insight and specialized expertise on various topics regarding the programmes of study of the Department. The two industry professionals that participate in the Advisory board are:

- Mr. Panayiotis Philimis, Founder and CEO of CyRIC - Cyprus Research and Innovation Center.
- Mr. George Malekkos, CEO & Software Innovation Architect of Powersoft.

Furthermore, as per the University's regulations, when reviewing the programmes of study, feedback from relevant industry professionals, as well as feedback from the Professional Bodies (ex. Cyprus Scientific and Technical Chamber (ETEK)), is taken into consideration in order to ensure that the programmes under revision, are updated with the latest bibliographical references and technology trends regarding their fields of study.

Additionally, the programme of study "Web and Smart Systems" often invites industry professionals as guest speakers to provide lectures and enrich the programme with their specialized knowledge and expertise. Find below a list of invited speakers delivered a talk at the Frederick University as well as some planned talks that will be offered in the near future:

- Mr. Loizos Tofas, Founder and CEO of T. C. Geomatic LTD, "Geographic Information Systems".
- Dr. Costa Constantinos, Data Management Systems Lab, "Spatial Big Data Management".
- Dr. Kleanthis Neokleous, Silversky3D Virtual Reality Technologies Ltd. "Cognitive and clinical training with Virtual Reality Technologies".
- Dr. Andreas Pamporis, Jarvic, "Adaptive Wearables Applications".

Mr. Alexandros Andreou, Creative Director Silversky3D, "A Shallow Dive Into VR

The courses of the programme, often contain case studies, or require student to collabodate with external industry stakeholder in order to fullfill an assignment or present a project proposal. For example,

- MSc student Stylianos Georgiou collaborated with Materia Group in the project Guided to develop an Augmented Reality smartphone application during the WSS589/WSS590 courses.
- MSc student Michalis Hadjidemetriou collaborated with VIPS taxi for the development of an Android application during the WSS503 course.
- MSc student Elias Kokkinos collaborated with the Municipality of Aglatzia in the project SaveOurFood to develop an Android application and a web platform during the WSS551 course.
- MSc student Michalis Massalas collaborated with IBSCY in the project CrodaGator: Crowdsourcing Aggregator to develop a web system during the WSS589/WSS590 courses.

Finally, the programme students are also provided the opportunity to come in contact with employers from the industry via the events that the University organizes, such as the Career Fair (Link). At the Career far organized at the 19th of May 2022, students had the opportunity to come in contact and exchange information with more than 30 possible employers from the industry.

1.c.	Consider extending the choice of electives courses to give more freedom to students to pick the desired direction of specialisation.

We accept and adopt the recommendation by the External Evaluation Committee.

The choice of elective courses for each specialization is expanded as shown in Annex 1 – Programme Structure, and Annex 2 – Course Descriptions. With this change in the Programme structure, students have to choose two courses out of five elective courses for each specialization (a total of ten elective courses for the Programme).

2. Student – centred learning, teaching and assessment (ESG 1.3)

Sub-area		*Non-compliant/ Partially Compliant/Compliant*
2.1	Process of teaching and learning and student-centred teaching methodology	Compliant
2.2	Practical training	Compliant
2.3	Student assessment	Compliant

Areas of improvement and recommendations

2.a. Greater clarity in how research is linked to teaching beyond the research informed descriptions of many study guides, particularly with regards to how students benefit from staff research involvement beyond being taught by active researchers.

The Department promotes the participation of postgraduate students in research projects through their Thesis, where the topic of the Thesis is related to the research work of their Thesis advisors. In the table below, examples of thesis work directly related to the Advisor's research work is provided. The name of the student, the thesis title and the name of the advisor(s) are listed.

STUDENT	THESIS TITLE	ADVISOR(S)
Rafael Alexandrou	Indoor Localization with Machine Learning	Dr Andreas Constantinides and Dr Harris Papadopoulos
Adrian Radu Runcan	A Generic Dynamic Routing Scheme for Network on Chip	Dr Chysostomos Chrysostomou and Dr Konstantinos Tatas
Ahmad Al-Zoubi	Mapping and Scheduling of OpenCL Workloads on Emerging Technologies	Dr Konstantinos Tatas
Michalis Massalas	Multi-Objective Optimization for Indoor Localization on Smartphones	Dr Andreas Constantinides

STUDENT	THESIS TITLE	ADVISOR(S)
Aphrodite Demetriades	"CrODA-Gator": A Crowdsourcing-based service for collecting, managing and mapping mobile data	Dr Andreas Constantinides
Christoforos Kronis	A Social Business Intelligence Platform for Smart Media Planning	Dr Andreas Constantinides and Dr Harris Papadopoulos
Nestoras Georgiou	Detecting Android Malware with Machine Learning Techniques	Dr Andreas Constantinides and Dr Harris Papadopoulos
Marios Andreou	Twitter Trending Topics Classification	Dr Harris Papadopoulos
Nasia Theodorou	Autonomous IoT – based Fire Detection and Prevention System	Dr Constantinos Tatas
Gioulianna Kalaitzidou	A Web-Based Health Platform for Speech and Language Pathologists	Dr Achilleas Achilleos
Ioannis Giorkas	Requirements Analysis and Evaluation of Smart City Platforms	Dr Achilleas Achilleos
Kyriakos Michael	A Non-Immersive Virtual Reality Web Framework for Restaurant Reservation Services (VRWF-RRS)	Dr Achilleas Achilleos
Erma Dymiotou	A Smart Personnel Management System for Businesses	Dr Achilleas Achilleos
Iasonas Iasonos	CloudScanner: An Automated Cloud Deployment Environment	Dr Achilleas Achilleos

Moreover, a number of publications (conferences and journals) have resulted from the Master thesis work undertaken by the students demonstrating the research nature of the conducted work. Below we provide an indicative list of these publications:

a) Nader Nader, Rafael Alexandrou, Andreas Pamporis, Harris Papadopoulos and Andreas Konstantinidis, “Smart Out-of-Home Advertising Using Artificial Intelligence and GIS Data”, 36th AAAI Conference on Artificial Intelligence, March 2022.

b) Achilleas Achilleos, Michalis Makrominas, Christos Markides, Rafael Alexandrou, Andreas Konstantinidis, Elena Papacosta, Panos Constantinides, Effie Zikouli and Leondios Tselepos, "Promoting active sports tourism through technology and evaluating its economic impact: experiences from Cyprus, Taylor & Francis, Journal of Sport & Tourism, (2021)

c) Achilleas Achilleos, Andreas Konstantinidis, Rafael Alexandrou, Christos Markides, Effie Zikouli, George Papadopoulos, "A Web Platform and a Context Aware Recommender System for Active Sport Events", 21st International Conference on Innovations for Community Services, I4CS 2021, May 26 - 28, Bamberg, Germany, 2021.

d) K. Tatas, A. Al-Zoubi, D. Zolotareva and A. Antoniou, "iPONICS: IoT Monitoring and Control for Hydroponics", in Proceedings of the 10th International Conference on Circuits and Systems Technologies (MOCAST 2021), Thessaloniki, Greece, 5-7 July, 2021.

e) R. Alexandrou, H. Papadopoulos, A. Konstantinidis. “Indoor Localization with Multi-objective Selection of Radiomap Models”. In Proceedings of the 16th IFIP International Conference on Artificial Intelligence Applications and Innovations (AIAI 2020). IFIP AICT 583, pp. 267-278. Springer, 2020

f) Ahmad Al-Zoubi, Konstantinos Tatas and Costas Kyriacou, "Fuzzy classification of OpenCL programs targeting heterogeneous systems" , Journal of Intelligent & Fuzzy Systems, vol. 39, no. 5, pp. 7189-7202 IOS Press, November 2020

g) Achilleas Achilleos, Christos Markides, Michalis Makrominas, Andreas Konstantinides, Rafael Alexandrou, Effie Zikouli, Elena Papacosta, Panos Constantinides and Leondios Tselepos, "Evaluating the Economic Impact of Active Sports Tourism Events: Lessons Learned from Cyprus", 7th International Conference of the International Association of Cultural and Digital Tourism (IACuDiT), Springer Proceedings, Culture and Tourism in a Smart, Globalized and Sustainable World, Hydra, 2-4 September, 2020.

h) Al-Zoubi and K. Tatas, “Rapid High-Level FPGA Resource Estimation for a Novel Heterogeneous Platform Scheduling Scheme”, Proc of 11th International Conference on Information and Communication Systems (ICICS 2020), April 7-9, 2020, Irbid, Jordan

i) Rafael Alexandrou, Harris Papadopoulos, Andreas Konstantinidis, "Smartphone Indoor Localization using Bio-Inspired Modeling" , Nature-Inspired Computation in Navigation and Routing Problems, Springer, 2019

j) Andreas Konstantinidis, Aphrodite Demetriades and Savvas Pericleous, "A Mulit-Objective Indoor Localization Service for Smartphones" , ACM Symposium on Applied Computing (ACM SAC’19), Limassol, Cyprus, April 8-12, 2019.

k) Achilleas Achilleos, Christos Markides, Andreas Konstantinidis, Ioannis Giorkas, Georgia M. Kapitsaki, Christos Mettouris, George A. Papadopoulos, "Adopting an Open Smart City Platform: A Survey", IEEE International Smart Cities Conference (ISC2 2019), Track: ICT Technologies and Platforms for Smart Cities IEEE, 2019.

l) Michalis Massalas, Andreas Konstantinidis, Achilleas Achilleos, Christos Markides and George Papadopoulos, "CrODA-gator: An Open Access CrowdSensing Platform as a Service", 5th CASPer Workshop 2018, 16th IEEE International Conference on Pervasive Computing and Communications, IEEE PerCom 2018.

m) H. Papadopoulos, N. Georgiou, C. Eliades and A. Konstantinidis. “Android Malware Detection with Unbiased Confidence Guarantees”. Neurocomputing, Vol. 280. Elsevier, 2018.

n) Al-Zoubi, K. Tatas and C. Kyriacou, "Towards Dynamic Multi-task Scheduling of OpenCL Programs on Emerging CPU-GPU-FPGA Heterogeneous Platforms: a Fuzzy Logic Approach", Proc of the 10th IEEE International Conference on Cloud Computing Technology and Science (CloudCom 2018), 10-13 December 2018, Nicosia, Cyprus

o) N. Georgiou, A. Konstantinidis and H. Papadopoulos. Malware Detection with Confidence Guarantees on Android Devices. In Proceedings of the 12th IFIP International Conference on Artificial Intelligence Applications and Innovations (AIAI 2016). IFIP AICT 475, pp. 407-418. Springer, 2016.

2.b.	Need to provide further opportunities for skills development in professional practice contexts. The programme team should consider a more explicit and clearly signposted inclusion of a placement/internship approach adapted to the needs of each student. This is a key contribution in the current setup of the programme, however this aspect can be problematic for the e-learning students as opportunities for placements and internships may be fewer where they are located.

The programme of study "Web and Smart Systems" often invites industry professionals as guest speakers to provide lectures and enrich the programme with their specialized knowledge and expertise. Find below a list of invited speakers delivered a talk at the Frederick University as well as some planned talks that will be offered in the near future:

- Mr. Loizos Tofas, Founder and CEO of T. C. Geomatic LTD, "Geographic Information Systems".
- Dr. Costa Constantinos, Data Management Systems Lab, "Spatial Big Data Management".
- Dr. Kleanthis Neokleous, Silversky3D Virtual Reality Technologies Ltd. "Cognitive and clinical training with Virtual Reality Technologies".
- Dr. Andreas Pamporis, Jarvic, "Adaptive Wearables Applications".
- Mr. Alexandros Andreou, Creative Director Silversky3D, "A Shallow Dive Into VR".

The courses of the programme, often contain case studies, or require student to collabodate with external industry stakeholder in order to fullfill an assignment or present a project proposal. For example,

- MSc student Stylianos Georgiou collaborated with Materia Group in the project Guided to develop an Augmented Reality smartphone application during the WSS589/WSS590 courses.
- MSc student Elias Kokkinos collaborated with the Municipality of Aglatzia in the project SaveOurFood to develop an Android application and a web platform during the WSS551 course.
- MSc student Michalis Massalas collaborated with IBSCY in the project CrodaGator: Crowdsourcing Aggregator to develop a web system during the WSS589/WSS590 courses.
- MSc student Michalis Hadjidemetriou collaborated with VIPS taxi for the development of an Android application during the WSS503 course.

Additionally, the Frederick University participates in the 2BeConnected program that links students with the Cypriot industry and operates within the framework of the European project "Liaison Offices

with the Labour Market". Frederick University students can register to the 2BeConnected web platform in order to establish a link with the industry and request a placement to organizations located in the Republic of Cyprus.

3. Teaching staff (ESG 1.5)

Sub-area		*Non-compliant/ Partially Compliant/Compliant*
3.1	Teaching staff recruitment and development	Compliant
3.2	Teaching staff number and status	Compliant
3.3	Synergies of teaching and research	Compliant

Areas of improvement and recommendations

3.a.	There is a need to close the student feedback loop and demonstrate to the students how quality evaluation results have been taken into consideration. An approach would be a student facing 'You said, we did' exercise. This is particularly important in the e-learning programme to ensure that the student voice is 'heard' and feedback is responded to.

This issue has already been addressed by the Internal Quality Assurance Committee. From the current academic year (2021 – 2022) the students' questionnaires will be analysed collectively by the Quality Committee of each Department. The findings of the Quality Committee will be presented to the Council of the Department where correction measures will be decided. The findings and the correction measures will be part of a report on this issue. This report will be made available to the students and also be discussed with the students during their meeting with the Department. This process will show to the students that their opinion is taken into consideration and also enhance the student involvement in the internal quality process.

3.b.	Define a process to evaluate quality and consistency of pedagogical approach when bigger classes are split into groups and managed different members of the adjunct staff.

Quality control mechanisms are already in place and are implemented by the Open and Distance Learning Center under the auspices of the Distance Learning Committee. There are already Master's programs that run with more than one groups and are managed by different members of the adjunct staff. One process, besides the quality control mechanisms, that ensures consistency and homogeneity is the compulsory training that all DL instructors attend at the beginning of every

semester. Additionally, each course has the course coordinator that is a full-time faculty member at the University and has the overall responsibility of designing, organizing and delivering the course based on the FU's pedagogical framework for the DL programs of study. The course coordinator is responsible in coordinating and administering all groups ensuring consistency and homogeneity in regards to the delivery of the course.

4. **Student admission, progression, recognition and certification** *(ESG 1.4)*

Sub-area		***Non-compliant/ Partially Compliant/Compliant***
4.1	Student admission, processes and criteria	Compliant
4.2	Student progression	Compliant
4.3	Student recognition	Compliant
4.4	Student certification	Compliant

4.a. No recommendations in this section.

We would like to thank the EEC for their positive remarks.

5. **Learning resources and student support** *(ESG 1.6)*

Sub-area		***Non-compliant/ Partially Compliant/Compliant***
5.1	Teaching and Learning resources	Partially compliant
5.2	Physical resources	Compliant
5.3	Human support resources	Compliant
5.4	Student support	Compliant

Areas of improvement and recommendations

5.a.	A significant percentage of grades in assessment (50%) is linked to the final exams in the programme. These exams operate mainly in a face-to-face format. An option would be to think about diversifying the assessment to include alternative forms of assessment, e.g., coursework or project-based work.

The evaluation method of assessing the student performance for each course, as well as the importance of different assessment methods for calculating the final grades are defined in the course outline (syllabus) which is given by the instructor during the first week (Week 1). In each course, there are the following 2 assessment methods: 1) Final evaluation, 2) Continuous evaluation:

- Final evaluation: obligatory for all courses and has 40-50% weight. The final evaluation may consist alternative forms of examination, such as final projects with oral presentations and take-home exams.
- Continuous evaluation: may include assignments, quizzes, midterm exams, research reports, simulations, problem solving learning scenarios, case studies, role playing, online presentations on advanced topics, (group) assignments with presentation. The continuous evaluation form and the weight of assessment are determined by the instructor in the course outline (syllabus). The weight is usually 50-60%.

Following the EEC above suggestion the instructors of the program will be encouraged to enrich the assessment methods employed in each course, by including other assessment activities such as debates, paper evaluations, case study scenarios, simulations etc.

5.b.	The virtual learning environment offers opportunities for interaction; however, these seem to be limited to online lectures with some student participation. The committee has not seen examples of innovative use of technology. A network simulator was mentioned in the discussions we had with members of staff.

The University gives great emphasis on the online interaction, the use of advanced technologies, the use of data analytics and the integration of innovative and alternative assessment practices mainly for continuous assessment. It also aims to take advantage of the full affordances of the online platform. It acknowledges the need and has been continuously working towards enhancing and updating its processes and educational material. There is a firm intention from the University to move in this direction. Consequently, to further promote the aforementioned, the Centre for Professional and Personal Development has already developed a professional development action plan in regards to the workshops/trainings/courses to be offered during the following academic year. Some of the courses will be considered as mandatory and some others as voluntarily. Some courses will be provided in-house, some others from collaborators/ experts outside university, and some others as MOOCs. One of the workshops / trainings to be provided focuses on the use of more advanced tools and pedagogies (i.e. simulations, serious games, augmented and virtual reality, adaptive assessment and e-assessment).

Along with the trainings, the Open and Distance Learning Center of the University will continue to pedagogically and technically support the DL instructors in regards to course design and delivery and educational material development.

The MSc in Web and Smart Systems (e-learning mode) incorporates the Dynamic Online Interaction (for both weekly learning activities and communication) pillar of the pedagogical framework for distance learning programs developed by the Distance Learning Unit of the Frederick University. The Dynamic Online Interaction pillar includes

- weekly dynamic online interaction activities that engage students in online discussions and collaborations
- provide students with opportunities to discuss, interact, share opinions, criticize and query their understanding of the key concepts introduced during the delivery of a course as well as to collaborate for the development of content/assignments

- online lectures (video and audio sessions) organized by instructors. The online lectures aim for content delivery and explanation, students' presentations, discussions among students, and among instructor & students. Furthermore, within the context of the teleconferences there are group assignments and discussions, problem solving scenarios, role playing, etc.
- the creation of discussion groups on the subject unit (e.g. personal statements, case study discussions, critical commentary of research articles), group simulation games, interactive problem-solving scenarios, the use of online files for collaboration, the development of wikis for collective writing, the utilization of blogs and/or micro-blogs (e.g. Twitter) for discussion, argumentation, critique, commentary, feedback.

DL instructors are also encouraged to use build-in platform tools (i.e. zoom for teleconferencing sessions, discussion forums, chat rooms, wikis) as well as tools outside the platform (i.e. websites, blogs, online documents, wikis).

With respect to the laboratory sessions and in order for the DL students to have the same experience as students in the conventional mode, the DL students have the opportunity to access all software (including those that require licence) available by the university though the Virtual Computer Laboratory (VCL). The VCL allows students to request access to any desktop computer in the university premises/laboratories and use it remotely from any place.

Additionally, almost all courses of the MSc in Web and Smart Systems include innovative software tools and simulators, which are open access and/or can be accessed by the VCL such as:

- DLWSS501 – includes open source network simulator NS-3/OMNeT++ that simulates and analyzes network activities and protocols
- DLWSS502 - includes ECLIPSE IDE / NetBeans IDE for web development as well as browser emulators to test a mobile website or web app in Chrome, Firefox, Safari, and Edge. Debugging is also shown with the Netbeans IDE - NetBeans Connector extension.
- DLWSS503 – includes the open source Android studio for smartphone application development.
- DLWSS504 – includes the Azure web portal for deploying and managing virtual machines and software applications, power scripting is used for automating deployment and management of virtual machines as well as injection and deployment of software application on virtual machines.

- WSS550 – utilizes browser emulators to test a mobile website or web app in Chrome, Firefox, Safari, and Edge. This allows testing web apps and websites to validate they deliver mobile-friendly, responsive and adaptive UIs for e.g., an Android or iOS device. Netbeans IDE - NetBeans Connector extension for the Chrome browser is used.
- WSS551 – includes the WEKA tool, an open source software with a collection of machine learning algorithm for data mining tasks.
- WSS552 – deploys Virtual Machines for each DL student that host a suite of sudo distributed Hadoop framework, NoSQL databases and analytic engines such as Apache Spark and Apache Hive.
- WSS530 – includes open source network simulator NS-3/OMNeT++ that simulate and analyze communication protocols
- WSS531 – includes Nimbix Supercomputing Suite and SimpleScalar processor simulators.
- WSS532 – uses Autodesk TinkerCAD that simulates both sensors and microprocessors.

Finally, the laboratory experience of DL students is also reinforced with the availability of platforms, tools, services and frameworks from Google cloud and Amazon web services.

5.c.	The discipline in which the DL/e-learning programme is in requires the use of laboratory based work that could create a disparity between the conventional and the e-learning programme if a justified objective is for both cohorts to have a broadly equivalent experience. There were steps in this direction and the use of a virtual computing lab was mentioned.

In order for the DL students to have the same laboratory experience as students in the conventional mode, the DL students have the opportunity to access all software (including those that require licence) available by the university though the Virtual Computer Laboratory (VCL). The VCL allows students to request access to any desktop computer in the university premises/laboratories and use it remotely from any place.

Additionally, almost all courses of the MSc in Web and Smart Systems include innovative software tools and simulators, which are open access and/or can be accessed by the VCL such as:

- DLWSS501 – includes open source network simulator NS-3/OMNeT++ that simulates and analyzes network activities and protocols

- DLWSS502 - includes ECLIPSE IDE / NetBeans IDE for web development as well as browser emulators to test a mobile website or web app in Chrome, Firefox, Safari, and Edge. Debugging is also shown with the Netbeans IDE - NetBeans Connector extension.
- DLWSS503 – includes the open source Android studio for smartphone application development.
- DLWSS504 – includes the Azure web portal for deploying and managing virtual machines and software applications, power scripting is used for automating deployment and management of virtual machines as well as injection and deployment of software application on virtual machines.
- WSS550 – utilizes browser emulators to test a mobile website or web app in Chrome, Firefox, Safari, and Edge. This allows testing web apps and websites to validate they deliver mobile-friendly, responsive and adaptive UIs for e.g., an Android or iOS device. Netbeans IDE - NetBeans Connector extension for the Chrome browser is used.
- WSS551 – includes the WEKA tool, an open source software with a collection of machine learning algorithm for data mining tasks.
- WSS552 – deploys Virtual Machines for each DL student that host a suite of sudo distributed Hadoop framework, NoSQL databases and analytic engines such as Apache Spark and Apache Hive.
- WSS530 – includes open source network simulator NS-3/OMNeT++ that simulate and analyze communication protocols
- WSS531 – includes Nimbix Supercomputing Suite and SimpleScalar processor simulators.
- WSS532 – uses Autodesk TinkerCAD that simulates both sensors and microprocessors.

Finally, the laboratory experience of DL students is also reinforced with the availability of platforms, tools, services and frameworks from Google cloud and Amazon web services.

5.d.	We recommend that the induction becomes compulsory for all students as this will help with learning support and the students benefiting further from the affordances of the learning platform. There is a positive long term impact on students if they complete compulsory induction activities in the beginning of their studies as this has good chances of reducing the level of support by administrative teams. This is particularly relevant for DL/e-learning students.

The University agrees with the Committee's recommendation for the induction course to become compulsory for all students and it is working towards that goal.

5.e.	We recommend that staff professional development around distance and online learning becomes part of a professional accreditation programme. The use of microcredentials for reward and recognition is worthy of exploration

Staff professional development related to teaching and assessment is the responsibility of the Centre for Professional and Personal Development of Frederick University. The Centre develops an annual professional development action plan in regards to the workshops/trainings/courses to be offered during the following academic year. Some of the courses are mandatory for the academic staff, while other courses can be attended voluntarily. The University agrees with the comment of the EEC that "the award of a certificate of attendance might not be a strong motivation for permanent and particularly adjunct staff" and is working on the establishment of other mechanisms to motivate the academic staff. As far as the use of microcredentials is concerned, for reward and recognition, the University is currently working on developing a system for awarding microcredentials which will include both learning and assessment. The University will explore the use of microcredentials as a form of recognition for the attendance to the courses offered by the Centre for Professional and Personal Development, which will include a form of assessment. The accumulation of such microcredentials can lead to the award of a certificate/diploma.

5.f.	We recommend that online interaction is further developed by the use of technologies such as virtual or augmented reality and computer simulations and serious games.

The University gives great emphasis on the online interaction, the use of advanced technologies, the use of data analytics and the integration of innovative and alternative assessment practices mainly for continuous assessment. It also aims to take advantage of the full affordances of the online platform. It acknowledges the need and has been continuously working towards enhancing and updating its processes and educational material. There is a firm intention from the University to move in this direction. Consequently, to further promote the aforementioned, the Centre for Professional and Personal Development has already developed a professional development action plan in regards to the workshops/trainings/courses to be offered during the following academic year. Some of the courses will be considered as mandatory and some others as voluntarily. Some courses will be provided in-house, some others from collaborators/ experts outside university, and some others as MOOCs. An indicative list is given below:

- Course on Instructional Design
- Course on Blended Teaching and Learning
- Workshops focused on the use of LMS and its tools (activities and resources)
- Workshops on the advanced use of LMS (i.e data analytics, use of H5P), other equipment, hybrid classrooms and Virtual Computer Labs
- Training on the use of more advanced tools and pedagogies (i.e. simulations, serious games, augmented and virtual reality, adaptive assessment and e-assessment).
- Trainings on innovative and alternative assessment and feedback methods and tools (within and outside LMS) (adaptive assessment, e-assessment and personalized feedback)
- Workshops on the use of technological web-based tools to enhance the teaching and learning process
- Workshops tailored to the needs of each department
- Workshops on Course Design and Delivery based on the Blended and Distance Learning Pedagogical Framework.
- Workshops on library resources and capacities
- Training on how to use ZOOM (face to face Vs online synchronous Vs hybrid classrooms)
- Training on how to integrate synchronous and asynchronous activities in courses
- The Open and Distance Learning Center of the University will continue to pedagogically and technically support the DL instructors in regards to course design and delivery and educational material development.

- In regards to the integration of the innovative and alternative assessment practices for **final** exams, the University will follow the regulatory frameworks in Cyprus and Greece.

5.g.	We recommended that further attention is given to enhancing the interactive elements in the programme's online platform to provide personalised feedback to student input (automated or tutor generated).

Please refer to previous answer 5f.

5.h.	We recommend that innovative assessment practice (e.g., use of open book or open world exams) continues after the pandemic as it is more suitable for this mode of delivery. The assessment strategy for this programme could be further enhanced by exam format design that puts further emphasis on critical reasoning and where any multiple choice questions, however small the percentage assigned to them are randomised and are drawn from a database of exam questions.

The use of open book exams is optional and up to the course instructor to decide. Exam questions are typically problem solving questions and critical reasoning questions, while in some cases some of the questions are multiple choice questions. Following EEC's comment, more emphasis will be given on incorporating critical thinking questions in the exams, while in the case where multiple choice questions will be used, then in this case this part of the exam will be conducted through the online platform, taking advantage of generating randomised questions from a question bank.

Following the EEC above suggestion the instructors of the program will be encouraged to enrich the assessment methods employed in each course, by including other assessment activities such as debates, paper evaluations, case study scenarios, simulations etc.

5.i.	We recommend a convergence of approaches and an alignment between the programmes in relation to the conventional and the e-learning delivery). This will benefit both cohorts. Approaches that could achieve this would be adopting a flexible approach, allowing the students to move from the conventional to the e-learning programme and vice versa.

We agree with the suggestion of the Evaluation Committee, however at this point the CYQAA prohibits the mixture of conventional and e-learning students in the same class.

6. Conclusions and final remarks

The committee has concluded that the Programme is worthy of support and recommends that it be approved. We offer a number of recommendations that we believe will further strengthen this programme: There is some overlap between the two reports (conventional and e-learning programme) for features and areas that we felt applied to both modes of delivery of the programme. **Specialisations requirements** There seems to be a discrepancy between the e-learning and the conventional version of the programme, in the sense that the two specialisations are only available to the candidates of the conventional programme and not to those of the e-learning programme. We strongly recommend that there is alignment between the programmes in this respect to ensure that the e-learning students have broadly the same experience and student journey as the students in the conventional programme. This should lead to either: 1. Not offering the specialisations in the conventional programme; 2. Or adding the specialisations and related structure to the e-learning programme. The team should consider extending the choice of elective courses to give more choice freedom to students. If option 2 is chosen this would also allow the students to have a better choice of electives towards the desired direction of specialisation.

The Department of Electrical Engineering, Computer Engineering and Informatics wishes to express its gratitude to the members of the External Evaluation Committee for their thorough and insightful evaluation of the master programme of study MSc in Web and Smart Systems (Distance Learning), as well as their fruitful comments and constructive discussion. The Department is fully satisfied with EEC's recommendation to approve the Program.

As far as the Specialization requirement is concerned, the Department believes that it is essential to have the two specializations and therefor proposes the option 2, that is, add the two specializations in the Distance Learning program. It is also noted that two extra elective courses have been added in the structure of the program, one for each specialization, in order to enrich more the two specializations.

Recommendations

Programme evaluation

- Consider including at least one representative from industry in the Internal Quality Committee, to ensure that the needs of the industry are taken into consideration and regularly updated.
- There is a need to close the student feedback loop and demonstrate to the students how quality evaluation results have been taken into consideration. An approach would be a student facing 'You said, we did' exercise. This is particularly important in the e-learning programme to ensure that the student voice is 'heard' and feedback is responded to.
- Define a process to evaluate quality and consistency of pedagogical approach when bigger classes are split into groups and managed by different members of the adjunct staff

Research and teaching nexus

Greater clarity in how research is linked to teaching beyond the research informed descriptions of many study guides, particularly with regards to clarity on how students benefit from staff research involvement beyond being taught by active researchers.

Placements/internships

Need to provide further opportunities for skills development in professional practice contexts. The programme team should consider a more explicit inclusion of a placement/internship approach adapted to the needs of each student. This is a key contribution in the current setup of the programme, however this aspect can be problematic for the distance learning students as opportunities for placements and internships may be fewer where they are located.

Assessment

A significant percentage of grades in assessment (50%) is linked to the final exams in the programme. These exams operate mainly in a face-to-face format. An option would be to think about diversifying the assessment to include alternative forms of assessment, e.g., coursework or project- based work.

Interactivity

- The virtual learning environment offers opportunities for interaction; however, these seem to be limited. The committee has not seen examples of innovative use of technology. A network simulator was mentioned in the discussions we had with members of staff.
- The discipline in which the DL/e-learning programme is in requires the use of laboratory based and practical work that could create a disparity between the conventional and the e-learning programme if a justified objective is for both cohorts to have a broadly equivalent experience. There were steps in this direction and the use of a virtual computing lab was mentioned.

All of the above recommendations are provided by the EEC in the main body of this report. The Department wishes to thank the EEC for their valuable recommendations. The response of Department is provided in the corresponding sections in the main body of the report.

Finally, The Department also wishes to thank the Cyprus Agency of Quality Assurance and Accreditation in Higher Education, as well as the members of staff of the Agency that facilitated the organisation and implementation of the External Evaluation Committee's visit and the accreditation of the MSc in Web and Smart Systems program of study.

7. **Higher Education Institution academic representatives**

Name	***Position***	***Signature***
Prof. George Demosthenous	Rector	

Date: 13/06/2022