Doc. 300.1.2

07.14.318.057

Higher Education Institution's Response

Conventional-face-to-face programme of study

Date: 14/09/2022

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

Programme

In Greek:

Μηχανική Μηχανολόγων Οχημάτων,

(4 ακαδημαϊκά έτη, 240 ECTS, Πτυχίο (BSc))

In English:

Automotive Engineering,
(4 academic years, 240 ECTS, Bachelor (BSc))

Language(s) of instruction: English

- **Specializations (if any):**

  In Greek: -
  In English: -

Programme's Status: Currently Operating

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)

Areas of improvement and recommendations

1.a. The program is strongly bound to Cyprus's needs, which is an advantage for the local community in general, but is a limitation for some students at the same time. The students of this BSc program also have very limited opportunities to continue their education in Cyprus. Creating such or at least presenting a clear path for academic development in a university environment will strengthen the BSc program. Engagements with automotive companies producing cars that are driven in Cyprus would be a great benefit for the program.

Department's Response:

The BSc Automotive Engineering at Frederick University offers students a high level education and professional skills for both further academic development in the area of Automotive Engineering and related fields of engineering or even cross cutting post-graduate studies (MBA, IT etc.) as well as the opportunity to commence a profession career in Cyprus or abroad. The fact that the graduates have less opportunities to continue their studies in Cyprus as pointed out by the evaluation committee has been recently identified by the HEI. The Mechanical Engineering Department is currently conducting a feasibility study and examines the possibility of offering a Master's programme focusing on the most suitable area of Automotive Engineering as driven by local industrial needs, as electronics/diagnostics, road safety, supply chain, alternative propulsion etc. It is vital to identify the most appropriate focus for such a post-graduate programme, in order to attract a wider audience not only from the local industry but also from the sector of policy makers, education as well as international students, thus, making it viable and successful. In addition, there is a great opportunity to pursue further professional postgraduate studies locally in Cyprus, namely (a) in the Professional Programme of the Engineer Officer of the Watch (EOOW) of the Cyprus Marine Technology Academy of Frederick University for being licensed as 3rd Engineers by the Deputy Ministry of Maritime of the Cyprus Republic, and (b) in the Training Programme for the Certification of Energy Auditors in Transportation

Category C', at the Frederick Training and Examination Centre, approved by the Ministry of Energy, Commerce, Industry and Tourism of the Republic of Cyprus.

The evaluation committee has urged the collaboration with car producing industry in Cyprus. Although Cyprus does not possess any renowned OEM manufacturing activity due to its small size, Frederick University has a close collaboration with several local SMEs dealing with the design and reconstruction of heavy duty and special duty road vehicles, such as trailers, tank or garbage trucks, fire fighting vehicles, ambulances etc. Additionally, the department has had research and industrial collaboration with car and engine producing companies as well as leading institutions in the frame of national and European funded projects, allowing for research collaborations in certain topics of automotive engineering, students and academic staff exchange, lecture material enhancement, use of specialized equipment etc. Moreover, taking the evaluation committee's recommendations in to consideration, our department will strive for students' industrial placements and internships at automotive engineering industries Europewide through the Erasmus+ program. Please find below a highlight of related activities towards this direction with the intention to intensify and expand them in the near future:

Activities	**Involved industries**
Design and Manufacture of Students' formula	Producing, manufacturing and machining companies in Cyprus, spare part distributing companies, panel beating and repair shops etc.
CORNET research project entltled Increase of the passive safety of cars for the protection of pedestrians by Crash Resistant Adhesive Bonding of attachments on Lacquered Surfaces (CrabLacs)	FORD plant in Cologne, Germany Laser Center in Hannover, Germany DELO GmbH, Adhesives manufacturer, Germany Panel beating and car paint shops, Cyprus
FP7 research project entitled *Development of Aero Engine Component Manu-facturing using Laser Additive Manufacturing (MERLIN)*	Rolls Royse, UK MTU, Germany, TURBOMECA, France TWI, UK further European SMEs
Participation in the Corporate Research Centre Transregio 10 funded by the German Research Foundation (DFG),: "*Integration of forming, cutting and welding for the integrated manufacturing of light-weight frame structures*"	BMW, MERCEDES BENZ as consulting OEMs

Activities	Involved industries
Participation in three (3) COST actions	European industrial partners as AIRBUS, AUDI etc.
RESTART research project entitled "Integration of Innovative Green Technologies on existing public Transportation Buses for 5% to 30% Fuel Savings"	Involvement of Cypriot bus re-construction SMEs Hydrogen Production and Storage company HYSTORE in Cyprus
Students' industrial placements and final year projects	Cypriot and European companies operating in the automotive sector design, manufacture, repairs, diagnostics etc. in collaboration with Frederick Liaison Office and ERASMUS+ program

Last but not least, in the context of the design and manufacture of the students' formula within our department there is a continuous and close collaboration of students with producing, manufacturing and machining companies in Cyprus as well as spare part distributing companies, panel beating and repair shops. A detailed list of the involved industrial partners and sponsors with their related activities is provided below:

Company	Activities
Panayi Panayiotis Machinery Ltd	Machinery, CNC machines, milling turning machines
Oasi Business And Technicians Ltd	Machinery, CNC machines, milling turning machines
Morfomichaniki Ltd	Machinery, CNC machines, milling turning machines, Molds
Nucleus Research & Development Centre Ltd	Research organization, product development
Digimind GmbH	Industrial research, blow moulding research (Germany)
Lakatamia Municipality	Workshop, Laser cutting, tube bending
Wamet Demetriades CNC	CNC supplier
Remedica Ltd	Pharmaceutical company, CNC milling and turning
Pecodea LTD	Lift Manufacturers, Milling, turning, punching, Plasma cutting, Sheet Bending
1E.Z Professional Ltd	Business that has managed to establish in the INOX chimney industry, CNC router, plasma cutting, TIG welding
Zevlaris Dimitris Ltd	Stainless steel constructions
Vassiliko Cement Works Public Company Ltd	CNC lathe machines, Milling, turning machines
High Efficiency Renewable Energies (H.E.R.E.) Ltd & Fornelia Ltd)	Renewable energy research organization, Solar oven, Machinery

Company	Activities
Deherco Ltd	Steel construction company, machinery, milling, turning, punching
SP Skies Ltd	Carbon fiber, Glass fiber, CNC router, Mould construction
Costas Theodorou Ltd	Travel Luggage, Business, Backpacks and Bags, Ladies Bags, Accessories, Disney & Kids, CAD/CAM systems, CNC router
Archimedes Ltd	Machinery, Sheet metal and tube bending, Laser and Plasma cutting
CNC Solutions	CNC Training Center, Milling, Turning (Greece)
Michael Michalis	Machinery, CNC machines, Milling, Turning, EDM
A. Antoniou Machinery Ltd	Building machines constructor

1.b. The assignments of ECTS to various courses do not appear to have a homogenous treatment. In the description of the courses, the assigned ECTS must be documented, especially in terms of student's anticipated workload and not only on teaching and Lab hours. would be a great benefit for the program.

Department's Response:

Frederick University has adopted a thorough and comprehensive Quality Assurance procedure and standards also in respect to the ECTS distribution calculation, which is documented in detail for all programs of studies, as well as for the BSc in Automotive Engineering. During the program's first two years, i.e. first four semesters, courses carry 5 ECTS whereas, in the 3rd and graduating year, i.e. semester 5-8, courses possess 6 ECTS due to the higher level of academic demands and individual effort to be brought by students. Thus, students must dedicate higher workload in actual hours for the course accomplishment. Please see below two examples on how students' load is calculated for two exemplary lessons of 5 and 6 ECTS respectively. We also enclose the detailed TESE forms of eight (8) Automotive Engineering courses in order to provide a clear picture of the ECTS distribution (please see Annex 01).

Estimated student's work time distribution in hours: AU201 - *Mechanics of Automotive Engineering Materials* (5 ECTS):			
Contact hours		Student's private time	
Lecture	37	Private Study	20

Estimated student's work time distribution in hours: AU201 - *Mechanics of Automotive Engineering Materials* (5 ECTS):			
Contact hours		Student's private time	
Lab Work	16	Writing and preparation of lab reports	16
Lab Assessment	2	Homework	8
Midterm Test	2	Test preparation	6
Final Exam	3	Final Exam Preparation	15
Total:	**60**	Total:	**65**
		TOTAL:	**125**

Estimated student's work time distribution in hours: AU404 - *Vehicle Crashworthiness* (6 ECTS):			
Contact hours		Student's private time	
Lecture	37	Private study	30
Mid-Term Test	2	Writing Lab report	12
Final Exam	3	Writing and Presentation of Assignment	12
Lab Work	22	Mid-term Test Preparation	10
Lab Assessment	4	Final Exam Preparation	18
Total:	**68**	Total:	**82**
		TOTAL:	**150**

2. Student – centred learning, teaching and assessment

(ESG 1.3)

Areas of improvement and recommendations

2.a.	The prospect of employability for students can be improved by updating teaching materials by using more modern textbooks and better guidance for the search of information by students. It is also recommended to introduce courses on electric mobility, which importance has been rapidly increasing in recent years globally. Improving internal collaboration with already existing at Fredrick University research area in alternative energy sources such as hydrogen is also strongly recommended.

Department's Response:

We accept and adopt the EEC recommendation. All course descriptions have been updated to include the latest bibliography textbooks and references (please refer to Annex 02 – Course Descriptions).

Moreover, in line with the evaluation committee's recommendation the program of study has been recently enriched with two new courses related to latest developments in electric and electronic assisted mobility, namely AU307 - Electric and Alternative Vehicle Propulsion Systems (Semester 6) and AU411 - Driver Assistance Systems (DAS) and Intelligent Vehicle Control (Semester 7). In addition to this, special topics about alternative energy propulsion and sources, notably hydrogen fuel cells technology and natural gas and liquified petroleum gas (LPG) systems are included in the course AU307 - Electric and Alternative Vehicle Propulsion Systems (Semester 6). Recent advances in natural gas technologies for internal combustion engines design including injection and combustion processes are incorporated as new reference material within the course AU401 - Vehicle Internal Combustion Engines Design (Semester 7).

Finally, alternative energy sources related topics, especially hydrogen, has been also incorporated in course AU307 based on the committee's recommendation. Frederick University's industrial partner Hystore Tech Limited, an innovative SME situated in Cyprus, currently provides and will intensify its contribution with actual research and industrial outcomes flowing in the courses in form of theoretical material, demonstrators, laboratory

exercises, students' placement in the conetxt of AU212 - Placement – Internship and final year projects (Theses) in the context of AU410 - Research Techniques for Thesis Preparation and AU406 - Final Year Project (Thesis).

3. Teaching staff

(ESG 1.5)

Areas of improvement and recommendations

3.a.	Academic personnel on the BSc program in Automotive engineering seem to have very limited research activities. This is acceptable in a short term but may lead to the degradation of education quality in a longer term. First signature of that can already be seen in largely outdated literature used in many courses. It is recommended to solicit more academic personnel on this program actively involved in research projects.

Department's Response:

The academic personnel involved in the BSc program in Automotive Engineering has a fair involvement in research activities and has demonstrated an adequate record of publications in related fields considering the department's relatively young history and size. Evidence of the high-quality work and research achievements is the publication record with above-average figures. Nevertheless, the room for improvement as suggested by the committee has been also identified by the Department. For this reason, as part of the strategic planning of the Department and the Programme, KPIs have been put in place, including automotive engineering specific KPIs, in order to further promote a research culture. Short-term and long-term KPIs for the last five years (2017-2021) have been captured for the academic personnel involved in the BSc Automotive Engineering as shown in table below:

Short-term KPIs	***Base Values (2017-21)***
Ranked Refereed journal articles (on Scopus)	120
Articles in a high IF journals	115
Books	2
Book chapters	6
Monographs	5
Refereed conference papers	46
Exhibitions/Events	4
MSC-ITN/IF & ERC Grant Applications	2

Short-term KPIs	***Base Values (2017-21)***
Submitted funding proposals (main participant)	57
Submitted coordinated proposals	32
PhD students supervised	10
Partnerships w/ Universities & RTOs	15
Working Collaborations (Industry, NGOs, public agencies)	43
Social Impact: Public outreach activities, presentations/public lectures, appearances in media	9
Training Programs Run	4
Student Placements	105
Industry/NGO led Theses	2
Long-term KPIs	***Base Values (2017-21)***
Citations	6708
Highly-cited papers (>75 citations)	12
H-index	6.94
External Funding (€)	2.143.529
Plenary talks/Keynote Speeches	5
Success rate in submitted funding proposals / Average Evaluation Score in funding proposals submitted	41%
International Collaborations	37
Successful PhD-theses supervised	2
Industry Income (in €)	127.598
Contributions & Impact on Public Policy	10

In addition to the captured KPIs, the academic personnel involved in the BSc program in Automotive Engineering has demonstrated participation in different research projects and development activities as well as publications related to automotive engineering specifically and transportation in general. The table below summarizes the most important related research projects and publications:

Research projects and collaborations:
EU-CONEXUS Plus, European University for Smart Urban Coastal Sustainability European Universities 2022 Erasmus+, Member in the Coastal Engineering Institute (CEI) Joint Research Institute (JRI) as Frederick University is Full Member, 2022 - 2026

Research projects and collaborations:
EU-CONEXUS European University for Smart Urban Coastal Sustainability", EU-CONEXUS Research for Society, HORIZON 2020 Programme - Science with and for Society (1 March 2021 – 29 February 2024), Member in the WP4-WG "Research infrastructures and resources"
RESTART 2016-2020, Integration of Innovative Green Technologies on existing public Transportation Buses for 5% to 30% Fuel Savings
Horizon 2020, AdditiveManufacturABLE (AMable)
FP7, Development of Aero Engine Component Manufacturing using Laser Additive Manufacturing (MERLIN)
German Research Foundation (DFG), Corporate Research Centre Transregio 10: "Integration of forming, cutting and welding for the integrated manufacturing of light-weight frame structures"
CORNET, Increase of the passive safety of cars for the protection of pedestrians by Crash Resistant Adhesive Bonding of attachments on Lacquered Surfaces (CrabLacs)
COST Action "CA18120 - Reliable roadmap for certification of bonded primary structures (CERTBOND)"
COST Action CM1404 "Chemistry of Smart Energy Carriers and Technologies (SMARTCATS)"
COST Action CA20127 "Waste biorefinery technologies for accelerating sustainable energy processes (WIRE)"
Participation in Evaluation of 4 European Commission Calls in the area of vehicle technologies and transport
3D-CFD Simulations of Fuel Spray Breakup under non-evaporation and reactive flow conditions for Marine Engine Applications, COST Action CM1404 Short Term Scientific Mission (STSM)
Satellite Attitude Control System: Agile CubeSat attitude control using a single omnidirectional reaction wheel (internal project)
On-demand route optimization for buses based on real-time data (internal project)
Vehicle human-machine interface: haptic feedback for pedestrian and cyclist safety (internal project)
Publications:
Katsanevakis, A.; Konstantinidis, D.; Karagiannis, G.; Ganias, A.; Karagiorgis, G.: Simulation of an isolated system behavior at high RES penetration coupled with storage, Discover Energy 2 (1), 1-24, 2022.
Budzik, M.K.; Wolfahrt, M.; Reis, P.; Kozłowski, M.; Sena-Cruz, J.; Papadakis, L. Saleh, M.N.; Machalicka, K.V.; Teixeira de Freitas, F.; Vassilopoulos, A.P.: Testing mechanical performance of adhesively bonded composite joints in engineering applications: an overview. The Journal of Adhesion, published online, August, 2021.
Papadakis, L.: Modelling and Simulation Methods for Additive Manufacturing Processes – Potentials and Limitations demonstrated by means of application examples. Chapter 22, Additive Manufacturing: Handbooks in Advanced

Research projects and collaborations:
Manufacturing, pp. 685-721, 2021.
Gkanas, E.I.; Stamatakis, E. Christodoulou, C.N.; Tzamalis, G.; Karagiorgis, G.: Study on the operation and energy demand of dual-stage Metal Hydride Hydrogen Compressors under effective thermal management, International Journal of Hydrogen Energy 46 (57), 29272-29287, 2021.
Papadakis, L.; Avraam, S.; Photiou, D.; Masurtschak, S.; Pereira J.C.F.: Use of a Holistic Design and Manufacturing Approach to Implement Optimized Additively Manufactured Mould Inserts for the Production of Injection-Moulded Thermoplastics. Journal of Manufacturing and Materials Processing 4(4), 100, October, 2020.
Gkanas, E.I.; Christodoulou, C.N.; Tzamalis, G.; Stamatakis, E.; Chroneos, A.; Karagiorgis, G.: Numerical investigation on the operation and energy demand of a seven-stage metal hydride hydrogen compression system for Hydrogen Refuelling Stations, Renewable Energy 147, 164-178, 2020.
Chasos, C. A. “CFD simulations of diesel multi-hole injector internal flow and spray jet development at increasing chamber pressure and temperature conditions". Proceedings of ILASS-Europe 2019, 29th European Conference on Liquid Atomization and Spray Systems. Paris, France, 2-4 September 2019.
Fyrillas, M.M.; Ioannou, Y.; Papadakis, L.; Rebholz, C.; Matthews, A.; Dounamidis, C.C: Phase-change with density variation and cylindrical symmetry: Application to selective laser melting. Journal of Manufacturing and Materials Processing 3(3), 62, July, 2019.
Fyrillas, M.M.; Papadakis, L.: Transient Powder Melting in SLM Using an Analytical Model with Phase Change and Spherical Symmetry in a Semi-Infinite Medium. Journal of Manufacturing and Materials Processing 3(2), 50, June, 2019.
Papadakis, L.; Chantzis, D.; Salonitis, K.: On the energy efficiency of pre-heating methods in SLM/SLS processes. The International Journal of Advanced Manufacturing Technology, Volume 95,Issue 1-4, March 2018, pp.1325-1338.
Hirulkar, N.S.; Jaiswal, P.R.; Alessandro, P.; Papadakis, L.: Influence of Mechanical surface treatment on the strength of mixed adhesive joint, Materials Today: Proceedings 5 (9), 18776-18788, 2018.
Jaiswal, P.R.; Hirulkar, N.S.; Papadakis, L.; Sundaram, K.K.; Joshi, N.B.: Parametric study of non-flat interface adhesively bonded joint Materials Today: Proceedings 5 (9), 17654-1766, 2018.
Chasos, C.: CFD simulations of the diesel jet primary atomization from a multihole injector, Ilass Europe, 28th european conference on Liquid Atomization and Spray Systems, 2017.
Chasos, C.A.; Karagiorgis, G.: Chapter 8. Diesel Internal Combustion Engine Emissions Measurements for Methanol-Based and Ethanol-Based Biodiesel Blends<Transportation and the Environment, 205-228, 2017.
Karagiorgis, G.; Christodoulou, C.N.; von Storch, H.: Design, development, construction and operation of a novel metal hydride compressor, International Journal of Hydrogen Energy 42 (33), 20923-21570, 2017.
Tsamaslis, P.; Karagiorgis, G.; Katsanevakis, A.: Hybridization of photovoltaics

Research projects and collaborations:
with pumped storage hydroelectricity. An approach to increase RES penetration and achieve grid benefits. Application in the island of Cyprus, Journal of Power Technologies 4 (97), 336-341, 2017.
Papadakis, L.; Hauser, C.: Experimental and Computational Appraisal of the Shape Accuracy of a Thin-walled Virole Aero-engine Casing Manufactured by means of Laser Metal Deposition. Production Engineering, Volume 11, Issue 4-5, October, 2017, pp. 389-399.
von Storch, H.; Karagiorgis, G.; Christodoulou, C.N.; Tzamalis, G.: Design, development, construction and operation of a novel metal hydride compressor, 2017.
Nearchou, A.C.; Omirou, S.L.: Assembly line balancing using differential evolution models, Cybernetics and Systems 48 (5), 436-458, 2017.
Omirou, S.L.: A CNC Parametric Programming Method for Manufacturing of Axisymmetric Mould Cavities, Journal for Manufacturing Science and Production 16 (3), 173-181, 2016.
Chasos, C.A.; Karagiorgis, G.N.; Christodoulou, C.N.: Emission measurements of naturally aspirated and turbo-charged diesel internal combustion engines for various biodiesel blends, International Journal of Sustainable Energy 34 (3-4), 142-153, 2015.
Papadakis, L.; Loizou, A.; Risse, J.; Schrage, J.: Numerical Computation of Component Shape Distortion Manufactured by Selective Laser Melting. Procedia CIRP, Volume 18, 2014, Proceedings of the International Conference on Manufacturing of Lightweight Components - ManuLight 2014, pp. 90-95.
Papadakis, L.; Schiel, M.; Vassiliou, V.; Loizou, A.; Dilger, K.: Adhesive Bonding of Attachments on Alternate Car Shell Surfaces in Automotive Final Assembly Lines. Procedia CIRP, Volume 18, 2014, Proceedings of the International Conference on Manufacturing of Lightweight Components - ManuLight 2014, pp. 180-185.
Papadakis, L.; Loizou, A.; Risse, J.; Bremen, S.; Schrage, J.: A Computational Reduction Model for Appraising Structural Effects in Selective Laser Melting Manufacturing. Virtual and Physical Prototyping, Volume 9, Issue 1, January, 2014, pp. 17-25.
Chasos, C.; Karagiorgis, G.; Christodoulou, C.: Technical and feasibility analysis of gasoline and natural gas fuelled vehicles, AIMs Energy 2 (1), 71-88, 2014.
Papadakis, L.; Loizou, A.; Risse, J; Bremen, S.: A thermo-mechanical modeling reduction approach for calculating shape distortion in SLM manufacturing for aero engine components. High Value Manufacturing: Advanced Research in Virtual and Rapid Prototyping: Proceedings of the 6th International Conference on Advanced Research in Virtual and Rapid Prototyping, Leiria, Portugal, 1–5 October, 2013.
Papadakis, L.; Vassiliou, V.; Menicou, M.; Schiel, M.; Dilger, K.: Adhesive Bonding of Attachments in Automotive Final Assembly. In: Yang, Gi-Chul; Ao, Sio-long; Gelman, Len (Eds.): IAENG Transactions on Engineering Technologies - Special Volume of the World Congress on Engineering 2012, Vol. 229. Springer, 2013, Chapter 56.
Papadakis, L; Schober, A.; Zaeh, M. F.: Considering Manufacturing Effects in

Research projects and collaborations:
Automotive Structural Crashworthiness: A Simulation Chaining Approach. International Journal of Crashworthiness, 2013. Taylor & Francis, March, 2013. (Published online)
Papadakis, L; Schober, A.; Zaeh, M. F.: Numerical Investigation of the Influence of Preliminary Manufacturing Processes on the Crash Behaviour of Automotive Body Assemblies. The International Journal of Advanced Manufacturing Processes, March, 2013, Volume 65, Issue 5-8, pp 867-880.
Chasos, C.A.; Karagiorgis, G.N.; Christodoulou, C.N.: Diesel internal combustion engine emissions measurements for methanol-based and ethanol-based biodiesel blends, Conference Papers in Science, 2013.
Chasos, C.A.; Christodoulou, C.N.; Karagiorgis, G.N.: CFD simulations of multi-hole Diesel injector nozzle flow and sprays for various biodiesel blends, Proceedings of 12th Triennial International Conference on Liquid Atomization, 2012.
Papadakis, L; Schober, A.; Zaeh, M. F.; Demosthenous, G.: A Simulation Approach for Chaining the Forming-Welding-Crash Behaviour of Sheet Metal Structures. Key Engineering Materials, Vol. 473 (2011), pp. 667-674. (Proceedings of the 11th International Conference SHEET METAL 2011, Leuven, Belgium, 18–20 April, 2011)
Chasos, C.A.; Ioannou, E.I.; Kouroufexis, A.E.; Christodoulou, C.N.; Artemi, P.M.: Biofuels production and testing in Internal Combustion Engines, Proceedings of the 3rd International Conference on Renewable Energy Sources, 2011.
Papadakis, L.: A Computer Aided Chaining Approach for Predicting the Shape Accuracy in Manufacture of Automotive Structures. Journal of Production Engineering. Berlin / Heidelberg: Springer, June 2010, Volume 4, Number 4, pp. 349–355.
Chasos, C.; Karagiorgis, G.; Christodoulou, C.: Utilisation of solar/thermal power plants for hydrogen production and application in the transportation sector, 7th Mediterranean Conference and Exhibition on Power Generation, 2010.
Papadakis, L.; Wohlfahrt, M.: Consortium and Proposal Topic Finding in the Area of Functional Multi-material Components and Structures. Austrian Advanced Lightweight Technology A^2LT Network Event, Austria, November, 2021.
Papadakis, L.: Numerical Analysis of Support Structures' Removal from Additively Manufactured Components. II International Conference on Simulation for Additive Manufacturing - Sim-AM 2019, Pavia, Italy, 11–13 September, 2019.
Jaiswal, P.R.; Hirulkar, N.S.; Reis, P.N.B., Papadakis, L.; Khan, S.N.: Effect of cyclic solar (UV) radiation and temperature on mechanical performance of single lap adhesive joint. International Conference on Intelligent Computing, Instrumentation and Control Technologies 2017 (ICICICT), July, 2017, pp. 182-189.
Hirulkar, N.S.; Jaiswal, P.R.; Papadakis, L.; Reis, P.N.B., Ferreira J.A.M.: Joint strength optimization of single lap adhesive joints by surface patterning. International Conference on Intelligent Computing, Instrumentation and Control Technologies 2017 (ICICICT), July, 2017,

Research projects and collaborations:
pp. 201-210.
Hauser, C.; Preece, N.; Papadakis, L.; Loizou, A.: 3D Printing of Net shape Geometries by Laser Metal Deposition. LIATODAY Newsletter, Volume 24, Issue 4, July, 2016, pp. 6-7, Laser Institute of America.
Hauser, C.; Preece, N.; Papadakis, L.: Developments in the Additive Manufacture of Aero Engine Components. Proceedings of the 7th European Aeronaurics Days, October 2015, pp. 333-338, EUROPEAN COMMISION
Hauser, C.; Preece, N.: Papadakis, L.; Loizou, A.: 5 Axis Laser Metal Deposition of Thin Walled Aerospace Casings, International Solid Freeform Fabrication Symposium, University of Texas, Austin, USA, 4–6 August, 2014.
Papadakis, L; Schober, A.; Zaeh, M. F.: Considering Manufacturing Effects in Automotive Structural Crashworthiness: A Simulation Chaining Approach, ICRASH 2012, Milan, Italy, 18–20 July, 2012.
Papadakis, L.; Branner, G.; Schober, A.; Richter, K.-H.; Uihlein, T.: Numerical Modeling of Heat Effects during Thermal Manufacturing of Aero Engine Components, The 2012 International Conference of Manufacturing Engineering and Engineering Management (ICMEEM), London, U.K., 4–6 July, 2012.
Papadakis, L.; Vassiliou, V.; Menicou, M.; Schiel, M.; Dilger, K.: Adhesive bonding on painted car bodies in automotive production lines: alternatives and cost analysis, The 2012 International Conference of Manufacturing Engineering and Engineering Management (ICMEEM), London, U.K., 4–6 July, 2012.
Papadakis, L.: FE-Modelling of Manufacturing and Joining Processes for high quality Vehicle Structures. Seminar Department of Mechanical Engineering and Manufacturing, University of Cyprus, Nicosia, 7 March, 2012.
Schiel, M.; Unger, C.; Papadakis, L.; Fischer, F.; Stute, U.; Overmeyer, L.; Dilger, K.: Cornet CrabLacs – Crash Resistant Adhesive Bonding on Lacquered Surfaces. 12th Colloquium: Joint Research in Adhesive Technology, Frankfurt am Main, 28–29 February, 2012.
Papadakis, L.; Branner, G.: Analysis of Structural Effects during Manufacturing of Aircraft Structures. 9th HSTAM International Congress on Mechanics, Limassol, Cyprus, 12–14 July, 2010.
Papadakis, L.; Zaeh, M. F.: A Virtual Process Chaining Approach for Predicting the Shape Accuracy of Automotive Structures. 3rd International Conference on Changeable, Agile, Reconfigurable and Virtual Production (CARV 2009), Munich, Germany, 5–7 October, 2009.
Papadakis, L.: The influence of Residual Stresses on the behaviour of vehicle structures during manufacturing. 3rd International Conference on Experiments/Process/System Modeling/Simulation & Optimization, Athens, Greece, 8–11 July, 2009.

Thereupon, special topics of the rendered research results are incorporated into the BSc Automotive Engineering courses as indicated in the table below:

Research topics	**Courses**
Hydrogen production, storage and use in transportation	AU307 - Electric and Alternative Vehicle Propulsion Systems
Alternative fuels' injection systems combustion	AU307 - Electric and Alternative Vehicle Propulsion Systems AU310 - Computational Fluid Dynamics Methodology and Applications AU401 - Vehicle Internal Combustion Engines Design
Adhesive bonding and welding of automotive structures	AU403 - Vehicle Structures AU404 - Vehicle Crashworthiness
Simulation chain forming-welding-crash	AU403 - Vehicle Structures AU404 - Vehicle Crashworthiness
Advances in CNC machining	AU407 - CAD/CAM Technology in Automotive Engineering
Mechatronic, control and automotive applications	AU303 - Vehicle Dynamics and Control AU411 - Driver Assistance Systems (DAS) and Intelligent Vehicle Control AU412 - Mechatronics in Vehicle Engineering

Moreover, the department has identified the need to expand its academic team and research activities in the area of Automotive Controls, Electronics and Mechatronics. For this reason, an academic position was announced in 2021 and is filled since January 2022 by Assistant Professor Evagoras Xydas with the aim to enhance the department's activities in the aforementioned research and teaching domain. Additionally, Dr Xydas is the founder and CEO of IREROBOT, an R&D firm that develops mechatronics systems and consults companies on automation and control. The mechatronic, control and automotive applications implemented at IREROBOT are included as examples in the taught material, thus, helping students to connect theory with industrial practice. Finally, our automotive laboratory personnel were reinforced with the new hire of Mr Andreas Chitis in 2021.

4. Student admission, progression, recognition and certification

(ESG 1.4)

Areas of improvement and recommendations

4.a. The system of assigning ECTS for courses needs to be clarified and ultimately standardised. At least some of the instruments, especially on the characterisation side, need to be upgraded. Virtual laboratory tools would also be nice to develop.

Department's Response:

As already mentioned in paragraph 1b, a detailed calculation of the ECTS is provided in the annex, so as to provide a clear picture of the ECTS distribution (please see Annex 01).

As far as the instrumentation is concerned the committee's suggestion has been adopted and the department has already purchased following equipment, or some are in the order and delivery stage to modernize our laboratory equipment:

Equipment
De Lorenzo AM02 Simulation board (Ignition Systems)
De Lorenzo AM03 Simulation board (Electric circuits)
De Lorenzo AM04 Simulation board (Engine operation)
De Lorenzo AM05 Simulation board (Sensors and Actuators/Controls)
De Lorenzo AM08 Simulation board (Electric components)
De Lorenzo DL3155AL2
De Lorenzo DL3155A02 (Charging and Ignition Systems)
De Lorenzo DL3155M02 (Electric Network)
De Lorenzo DL3155A01(Automotive Electric components and circuits)
De Lorenzo DL3155M07
Gas analyser KANE Auto5-3 repair and maintenance and calibration (yearly)
Bosch BEA460 exhaust gas analyser for gasoline and diesel engines (smoke opacity measurement module) with on-board diagnostics (OBD) device and auxiliaries, maintenance and calibration (yearly)
Arduino-based car-kits
CAN bus shields for arduino (x3)
E-blocks2 CAN bus training course Arduino & flowcode software
KVASER OBD II Computer Interface for training

Finally, due to the pandemic virtual laboratories were adopted where and when possible, in order to allow for online student attendance. Following laboratories were performed with great success virtually with the aid of the specific software listed:

Course	Laboratory	Software
ME113 - Mechanical Engineering Drawing (Computer Aided Drafting	Computer laboratory exercises	AUTOCAD
ME203 - Computer Aided Design Methodology	Computer laboratory exercises	SOLIDWORKS
AU310 - Computational fluid Dynamics Methodology and Applications	Computer laboratory exercises for CFD simulation Demonstration of research results of CFD simulations	STAR-CD
AU401 Vehicle Internal Combustion Engines Design	Computer laboratory Exercise for CFD simulation	STAR-CD
AU403 - Vehicle Structures	Design projects and assignments	SOLIDWORKS
AU404 - Vehicle Crashworthiness	Modelling setup, assignments and accident reconstruction	LS-DYNA PC-Crash
AU407 - CAD/CAM Technology in Automotive Engineering	CNC programming and simulation	Haidenhain

4.a. Despite the keen interest from the Management team of the University, the number of female students is very low. The management must keep on trying to change it and must seek for new ways of doing it.

Department's Response:

As part of the University's policy is to promote gender equality over time and to empower all women and girls so that they can meet the current challenges and become the change our world needs.

The University has launched a long-term campaign with the aid of successful women in the fields of Engineering, as a source of inspiration for young girls, as well as promoting the prospects of pursuing a career in Engineering and Technology. In addition, as part of the campaign, the University is currently offering scholarships to female applicants wishing to study in undergraduate programs under the School of Engineering. The campaign can be found via the social media of the University (Scholarships for Women in STEM (Link),

Women and Girls in Science (Link)) and the policies regarding equality, diversity and inclusion matters are published in the University's website; (a) University Policies (Link) (b) The role of Frederick University in gender equality issues (Link), (c) Participation in ACT-on-Gender European Project for gender Equality (Link).

5. Learning resources and student support

(ESG 1.6)

Areas of improvement and recommendations

5.a.	Teaching materials on most courses starting from recommended course literature must be updated.

Department's Response:

We accepted and adopted the EEC recommendation. All course descriptions have been updated to include the latest bibliography textbooks and references (please refer to Annex 02 Course Descriptions).

6. Conclusions and final remarks

In general, this is a functional program worthy of continuation. It is well set for addressing present ground-level needs in the Cyprus market. However, it does very little to prepare students for upcoming challenges starting from sustainable recycling needs as well as the increasing number of electric and autonomous vehicles on the roads. Gender equality and development plans based on UN sustainable development goals are named in the program presentation. However, the commission would like to see more specific steps that are under way or are at least planned for implementation in near future.

Department's Response:

Sustainability and recycling aspects have been adopted as per committee's recommendations in the courses AU307 - Electric and Alternative Vehicle Propulsion Systems and AU411 - Driver Assistance Systems (DAS) and Intelligent Vehicle Control with the inclusion of latest developments in automotive industries as elaborated previously. Furthermore, AU403 – Vehicle structure was also updated and enhanced with topics on sustainable design, weight reduction, disassembly operations in automotive industries, material recycling and reuse and Life Cycle Analysis (LCA) to comply with the latest trends in automotive production. (Please refer to Annex 02).

As far as the UN sustainable development goals are concerned the university has recently taken following actions towards their achievement:

1. The university actively supports the UN sustainable development goals and this is also evident from its very good performance in the THE impact rankings. Frederick University ranked among the top 101-200 Universities in the world in all four categories that were considered for its overall score, making it one of only two Universities in Cyprus and Greece (out of a total of fifteen participating Universities) which overall ranked in the top 301-400 Universities worldwide.

   The Times Higher Education Impact Rankings measure Universities' research, teaching, outreach and stewardship against the United Nations' SDGs. In particular, academic institutions are invited to submit metrics for SDG17 (Partnership for the Goals), which explores how Universities educate the next generation on sustainability, and at least three other SDGs of their choice.

   Frederick University ranked among the top 101-200 universities in the world in:

a. SDG 4: Quality Education,
b. SDG 7: Affordable and Clean Energy,
c. SDG 10: Reducing Inequalities,
d. SDG 17: Partnership for the goals

Frederick University ranked first among all participating Universities in Greece and Cyprus in SDG 17. This achievement reflects the University's efforts to educate the young generation to adopt sustainability, by offering relevant programs of study such as the postgraduate programs of study in "Education for Sustainable Development and Social Change" and "Sustainable Energy Systems" and by integrating relevant subjects in all its curricula. It also acknowledges the University's networking and collaboration with other institutions in Cyprus and abroad for the exchange of good practices and the development of strategic synergies to achieve the SDGs.

The University's particularly high scores this year in the indicators concerning all axes of sustainability, i.e. quality education, environmental issues, social issues and the global partnerships it has developed to achieve the SDGs, confirm the University's strategic goal to become an agent of change.

2. As indicated in the attached report (please see Annex 03), a mapping on both research level and at curriculum level has been completed for identifying areas of good practice and developing a plan for enhancing SDGs in the curriculum.
3. One specific measure that has already been implemented with respect to gender equality is to offer 50% scholarships to all female students that enter the program (Women in STEM campaign). Furthermore the University's Center on Gender Issues, Diversity and Equality (Link) implements policies and promotes training and activities regarding gender equality in both staff and students (more details can be found on University's website in the following Link).
4. Also the university, in collaboration with Chevron offers a number of 100% scholarships to female students that enter engineering programs (Link for the chevron scholarship).

Additional comments on the application:

- All course descriptions must have a common format. Learning outcomes and course contents must either be in bullets or numbered.
- Do not mention in learning outcomes, “By the end of the course, students must be able to:”. It is implied.
- Avoid mixing Bold, underlined, double underlined, etc. in course descriptions. Keep the same format in all sub-headings
- In some courses you mention
    - AU401 - Vehicle Internal Combustion Engines Design, “The present course belongs in the BSc. in Automotive Engineering programme and provides advanced and specialized knowledge of ICE design, calculation, modelling and simulation which is required for automotive engineers working in research and development of ICE.”
    - AU310 - Computational Fluid Dynamics (CFD) methodology and applications, “The present course is compulsory in the BSc. in Automotive Engineering programme and provides advanced theoretical knowledge and CFD methodologies for flow simulations.”
    - It is redundant information.
- AU110 – expand it to include current types of vehicles
- AU201 - Mechanics of Automotive Engineering Materials with Lab (do you need to say that, as most courses have labs)
- AU206 - Electronic Management Systems, course purpose is different .. it is on ICE .. nothing about electronics

  The course aim is to introduce students to the concept of Vehicle Internal Combustion Engines Management, basic considerations and terminology. Students should be able to recognize basic components, comprehend the fundamental background theory of vehicle ICE system management, and practical skills and attitudes on servicing and repairs of the vehicles ICE systems in the automotive laboratory.

Department's Response:

We accepted and adopted the EEC recommendation. As already mentioned, all course descriptions have been updated as shown in Annex 02 – Course Descriptions.

The Department of Mechanical Engineering wishes to express its gratitude to the members of the External Evaluation Committee for their thorough and insightful evaluation of the undergraduate programme of study BSc in Automotive Engineering, as well as their fruitful comments and constructive discussion. The accreditation process provided the opportunity to the Department and the Program Coordinator to obtain the objective views of external and independent peers, as well as examine aspects of the program from a different perspective. The Department has already considered the issues raised, as well as the recommendations of the EEC and has already acted upon, in terms of implementing the Committee's recommendations as shown in sections 1 to 5.

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 evaluation of the program of study.

B. Higher Education Institution academic representatives

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

Date: 14/09/2022