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FOURTH-YEAR PROJECTS PROPOSED BY OLABISI FALOWO 2024

List of Projects	
Project ID	**Project Title**
OF24-01	Design of a Pricing Algorithm for Efficient Resource Management in an Integrated Terrestrial and Non-Terrestrial Network
OF24-02	Design of a Load Balancing Scheme for an Integrated Terrestrial and Non-Terrestrial Network
OF24-03	Hierarchical Network Selection Scheme for the 6G Network
OF24-04	Multi-RAT Handover Algorithm for Supporting Multi-RAT Connectivity in the 6G Network
OF24-05	Impact of Emerging Network Services on Network Resource Utilization and QoS Provisioning in the 6G Network
OF24-06	Predictive Admission Control and Bandwidth Allocation Scheme for Integrated Terrestrial and Non-Terrestrial Network
OF24-07	Incentive Pricing for Accelerating Users' Migration in the Next Generation Mobile Network

EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-01**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Design of a Pricing Algorithm for Efficient Resource Management in an Integrated Terrestrial and Non-Terrestrial Network**	
DESCRIPTION:	The sixth generation (6G) wireless network is expected to support a more diverse set of services, applications, and users than the existing mobile networks. Thus, it is important to develop an efficient pricing algorithm for 6G networks. Dynamic pricing algorithms have been used for congestion control in mobile networks. However, the current dynamic pricing algorithms are not suitable for use in the 6G network. The purpose of this project is to review existing pricing algorithms, design and implement a pricing algorithm that can be used for efficient resource management in the6G wireless network.	
DELIVERABLES:	A review of pricing algorithm, implemented pricing algorithm, simulation results, and report.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) design a pricing algorithm for the 6G network, and (2) implement the pricing algorithm.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the performance of the designed pricing algorithm through simulations.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop a pricing algorithm, and implement the pricing algorithm using MATLAB or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

***NOTE: Complex engineering problems** require in-depth fundamental and specialized engineering knowledge and have one or more of the characteristics:

- are ill-posed, under- or overspecified, or require identification and refinement;
- are high-level problems including component parts or sub-problems;
- are unfamiliar or involve infrequently encountered issues;

and their solutions have one or more of the characteristics:

- are not obvious, require originality or analysis based on fundamentals;
- are outside the scope of standards and codes;
- require information from variety of sources that is complex, abstract or incomplete;
- involve wide-ranging or conflicting issues: technical, engineering and interested or affected parties.

****NOTE: GA 4:** The balance of **investigation and experiment** should be appropriate to the discipline. Research methodology to be applied in research or investigation where the student engages with selected knowledge in the research literature of the discipline. An **investigation differs from a design** in that the objective is to produce knowledge and understanding of a phenomenon and a recommended course of action rather than specifying how an artifact could be produced.

Ethics clearance questionnaire

		Yes	No
Q1	Does this project involve data collection		X
Q2	Does this project involve utilizing a third-party data set		X
Q3	Does this project utilize machine learning (ML) or artificial intelligence (AI)? **(Optional)**		
Q4	Does it exceed the minimum risk defined here: Link [Answer is No here if your project does not utilize ML and AI]		X
Q5	Does this project involve external parties, funders, etc		X

Answer the following questions if you answer "**Yes**" to any of the above questions.
If the answer is "**Yes**" to **Q1**, please answer the following questions:

		Yes	No
Q6	Are there humans or animals directly involved in the data collection process or contains any identification information		

If the answer is "**Yes**" to **Q2**, please answer the following questions:

		Yes	No
Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
Q8	Are the third-party data used from an open source?		
Q9	Are the third-party data used from a different research group?		
Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

If the answer is "**Yes**" to Q5, please answer the following questions:

		Yes	No
Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
Q12	Will there be a chance for any conflict of interest between the parties? [If Yes, provide details of the issue and your plan to solve it]		

EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-02**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Design of a Load Balancing Scheme for an Integrated Terrestrial and Non-Terrestrial Network**	
DESCRIPTION:	It is envisaged that the 6G network will integrate the terrestrial and non-terrestrial network to provide continuous coverage and consistent QoS to users. An important aspect of the 6G network is traffic offloading and load balancing between the terrestrial and non-terrestrial networks, considering the traffic that will be generated from diverse group of users. The purpose of this project is to develop a scheme for load balancing in an integrated terrestrial and non-terrestrial network.	
DELIVERABLES:	A review of load balancing schemes, a load balancing algorithm, simulation results, and report	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) design a scheme for load balancing in an integrated terrestrial and non-terrestrial network, and (2) implement the scheme.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the performance of the designed load balancing scheme through simulations.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop a load-balancing scheme, and implement the load-balancing scheme using MATLAB, Python, or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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Q5	Does this project involve external parties, funders, etc		X

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Q6	Are there humans or animals directly involved in the data collection process or contains any identification information		

If the answer is "**Yes**" to **Q2**, please answer the following questions:

		Yes	No
Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
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Q9	Are the third-party data used from a different research group?		
Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

If the answer is "**Yes**" to Q5, please answer the following questions:

		Yes	No
Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
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EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-03**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Hierarchical Network Selection Scheme for the 6G Network**	
DESCRIPTION:	In mobile networks, Multi-RAT connectivity can be used for capacity aggregation, enhanced QoS provisioning, and improved reliability. The objective of this project is to develop a hierarchical scheme for selecting multiple cells from a single or multiple RATs for mobile devices supporting multi-connectivity in the 6G network. Thus, the developed scheme will be able to combine network resources from multiple cells of a single RAT or multiple RATs to support individual user's services.	
DELIVERABLES:	A review of network selection scheme, implemented hierarchical network selection scheme, simulation results, and report.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) design a hierarchical network selection scheme for the 6G network, and (2) implement the hierarchical network selection scheme.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the performance of the hierarchical network selection scheme through simulations.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop a hierarchical network selection scheme, and implement the hierarchical network selection scheme using MATLAB or other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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Q2	Does this project involve utilizing a third-party data set		X
Q3	Does this project utilize machine learning (ML) or artificial intelligence (AI)? **(Optional)**		
Q4	Does it exceed the minimum risk defined here: Link [Answer is No here if your project does not utilize ML and AI]		X
Q5	Does this project involve external parties, funders, etc		X

Answer the following questions if you answer "**Yes**" to any of the above questions.
If the answer is "**Yes**" to **Q1**, please answer the following questions:

		Yes	No
Q6	Are there humans or animals directly involved in the data collection process or contains any identification information		

If the answer is "**Yes**" to **Q2**, please answer the following questions:

		Yes	No
Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
Q8	Are the third-party data used from an open source?		
Q9	Are the third-party data used from a different research group?		
Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

If the answer is "**Yes**" to Q5, please answer the following questions:

		Yes	No
Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
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EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-04**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Multi-RAT Handover Algorithm for Supporting Multi-RAT Connectivity in the 6G Network**	
DESCRIPTION:	The 6G network is network is envisioned to support multi-RAT connectivity, which will necessitate multi-RAT handover. A multi-RAT handover occurs when an ongoing session supported through multiple RATs is to be handed over to another set of RATs. The objective of this project is to develop a scheme for supporting multi-RAT handover in the 6G network.	
DELIVERABLES:	A review of vertical handoff algorithms, implemented multi-RAT handoff algorithm, simulation results, and report.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) design a multi-RAT handover algorithm for the 6G network, and (2) implement the multi-RAT algorithm.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the performance of the designed multi-RAT handover algorithm through simulations.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop an algorithm for supporting multi-RAT handover in the 6G network, and implement the scheme using MATLAB, Python, or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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Q1	Does this project involve data collection		X
Q2	Does this project involve utilizing a third-party data set		X
Q3	Does this project utilize machine learning (ML) or artificial intelligence (AI)? **(Optional)**		
Q4	Does it exceed the minimum risk defined here: Link [Answer is No here if your project does not utilize ML and AI]		X
Q5	Does this project involve external parties, funders, etc		X

Answer the following questions if you answer "**Yes**" to any of the above questions.
If the answer is "**Yes**" to **Q1**, please answer the following questions:

		Yes	No
Q6	Are there humans or animals directly involved in the data collection process or contains any identification information		

If the answer is "**Yes**" to **Q2**, please answer the following questions:

		Yes	No
Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
Q8	Are the third-party data used from an open source?		
Q9	Are the third-party data used from a different research group?		
Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

f the answer is "**Yes**" to Q5, please answer the following questions:

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Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
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EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-05**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Impact of Emerging Network Services on Network Resource Utilization and QoS Provisioning in the 6G Network**	
DESCRIPTION:	It is envisaged that emerging services such as virtual reality, augmented reality, mobile hologram, haptic communication, etc., will be prevalent in the 6G network. These emerge services require very high data rate and low latency, and consequently will have great impact of resource utilization and connection-level QoS in the 6G network. The objective of this project is to review emerging network services and investigate the impact of selected emerging network services on radio resource utilization, fairness in resource allocation, and QoS provisioning in the 6G network.	
DELIVERABLES:	A review of emerging network services, network model, analysis of emerging network services, and simulation results.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) Analyse emerging network services, (2) develop a network model, and (3) evaluate the impact of emerging network services on on radio resource utilization, fairness in resource allocation, and QoS provisioning in the 6G network.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the impact of emerging network services on radio resource utilization, fairness in resource allocation, and QoS provisioning in the 6G network.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model supporting emerging network services and carry out simulation of selected emerging network services using MATLAB, Python, or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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Q1	Does this project involve data collection		X
Q2	Does this project involve utilizing a third-party data set		X
Q3	Does this project utilize machine learning (ML) or artificial intelligence (AI)? **(Optional)**		
Q4	Does it exceed the minimum risk defined here: Link [Answer is No here if your project does not utilize ML and AI]		X
Q5	Does this project involve external parties, funders, etc		X

Answer the following questions if you answer "**Yes**" to any of the above questions.
If the answer is "**Yes**" to **Q1**, please answer the following questions:

		Yes	No
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If the answer is "**Yes**" to **Q2**, please answer the following questions:

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Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
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If the answer is "**Yes**" to Q5, please answer the following questions:

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EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-06**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Predictive Admission Control and Bandwidth Allocation Scheme for Integrated Terrestrial and Non-Terrestrial Network**	
DESCRIPTION:	The sixth generation (6G) mobile network will combine the terrestrial and non-terrestrial networks to provide ubiquitous coverage and consistent QoS to different groups of users in a flexible manner. Thus, a user may be connected through different types of networks during a communication session. Incorporating a predictive technique in admission control and allocation of bandwidth for diverse users' services can enhance QoS provisioning and radio resource utilization efficiency in the 6G network. The purpose of this project is to review existing call admission control and bandwidth allocation algorithms and develop a predictive call admission control and bandwidth allocation scheme for the 6G network. An aspect that may be exploited in this project is the prediction of individual user's service time.	
DELIVERABLES:	Literature review, predictive call admission control and bandwidth allocation scheme, simulation results, simulation code, and report.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to (1) review existing call admission control and bandwidth allocation algorithm, (2) design a predictive call admission control and bandwidth allocation algorithm, and (3) implement the call admission control and bandwidth allocation algorithm.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the performance of the predictive call admission control and bandwidth allocation algorithm through simulations.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop a predictive call admission control and bandwidth allocation algorithm, and implement the algorithm using MATLAB or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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		Yes	No
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Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

If the answer is "**Yes**" to Q5, please answer the following questions:

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Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
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EEE4022S/F Topic template

Student proposed?	*Y/N* *N*	*If Y, student name*
ID:	**OF24-07**	
SUPERVISOR:	Olabisi Falowo	
TITLE:	**Incentive Pricing for Accelerating Users' Migration in the Next Generation Mobile Network**	
DESCRIPTION:	A major challenge in mobile networks is migration of network users to the newest generation of mobile network in a heterogenous network. Incentive pricing can be used to accelerate users' migration to the next generation mobile network. Incentive pricing has been used in mobile networks to enhance congestion control, traffic-offloading, cooperative sensing, cooperative resource sharing, etc. The objective of this project is to develop an incentive pricing scheme to accelerate users' migration to the newest generation of mobile networks in heterogeneous wireless networks.	
DELIVERABLES:	A review of incentive pricing schemes, an incentive pricing scheme, simulation results, and report.	
SKILLS/REQUIREMENTS:	MATLAB, Python, or any other programming language, Knowledge of EEE4121F.	
GA 1: Problem solving: *Identify, formulate, analyse and solve complex* engineering problems creatively and innovatively*	The student is expected to develop and implement an incentive pricing scheme for accelerating users' migration in heterogeneous wireless networks.	
GA 4: Investigations, experiments and analysis:** *Demonstrate competence to design and conduct investigations and experiments.*	The student is expected to investigate the impact of incentive pricing on users migration in heterogeneous wireless networks.	
GA 5: Use of engineering tools: *Demonstrate competence to create, select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems*	The student is expected to develop a network model, develop an incentive pricing scheme, and implement the pricing scheme using MATLAB or any other programming language.	
EXTRA INFORMATION:	For a student interested in pursuing a master's degree, the project can be expanded to an MSc dissertation.	
BROAD Research Area:	Wireless Networks	
Project suitable for ME/ ECE/EE/ALL?	EE/ECE students who have taken EEE4121F course.	

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		Yes	No
Q1	Does this project involve data collection		X
Q2	Does this project involve utilizing a third-party data set		X
Q3	Does this project utilize machine learning (ML) or artificial intelligence (AI)? **(Optional)**		
Q4	Does it exceed the minimum risk defined here: Link [Answer is No here if your project does not utilize ML and AI]		X
Q5	Does this project involve external parties, funders, etc		X

Answer the following questions if you answer "**Yes**" to any of the above questions.
If the answer is "**Yes**" to **Q1**, please answer the following questions:

		Yes	No
Q6	Are there humans or animals directly involved in the data collection process or contains any identification information		

If the answer is "**Yes**" to **Q2**, please answer the following questions:

		Yes	No
Q7	Are the third-party data used anonymous (data does not contain human or animal-related information?)		
Q8	Are the third-party data used from an open source?		
Q9	Are the third-party data used from a different research group?		
Q10	If the answer to **Q9** is "**Yes**", do you have the approval to use third-party data sets? Attach the proof to PSQ application.		

If the answer is "**Yes**" to Q5, please answer the following questions:

		Yes	No
Q11	Have you signed an MOU between the parties [If Yes, attach the proof to PSQ application.]		
Q12	Will there be a chance for any conflict of interest between the parties? [If Yes, provide details of the issue and your plan to solve it]		