

5G Technology (Certificate)

5G is the wireless data communications system that will replace the 4G LTE systems currently in use around the world. However, 5G is not an update on 4G. It is a radically new system, using many different architectures, algorithms, circuits, chips and antennas than the previous system. 5G will enable faster streaming to mobile devices with theoretical speeds of up to 10 Gb/s as well as enabling the next generation of the Internet of Things.

As industry is working at a breakneck pace to build out these systems, there is a high demand for engineers who are fluent in the technological challenges and opportunities of this generational leap to 5G.

With a certificate in 5G Technologies, you will be well-equipped to work at the forefront of pivotal technology powered by advanced and advancing communications technologies.

Plan of Study

The 5GT GCP requires a total of 12 credit hours consisting of four graduate-level Electrical and Computer Engineering courses taken for a letter grade. Courses labeled "EOL" will be offered both as live classes and through EOL. Those without "EOL" are only offered to on-campus students. To view a full list of Electrical and Computer Engineering certificate degrees and courses, please visit their department website (<https://ece.ncsu.edu/grad/certificate/>).

More Information

5G Technologies Program Website (<https://www.ece.ncsu.edu/grad/certificate/>)

Distance Website (<https://online-distance.ncsu.edu/program/5g-technology/>)

Application Information

Students must meet ONE of the following requirements for admission into the 5G Graduate Certificate Program:

- Have a BS degree in Electrical or Computer Engineering from a regionally accredited four-year college or university, and have an overall GPA of at least 3.0 on a 4-point scale.
- Have a BS degree in the sciences or engineering from a regionally accredited four-year college or university with an overall GPA of at least 3.0 on a 4-point scale.
- Be a degree-seeking student in good standing in an NC State University graduate program in the sciences or engineering.

Applicant Information

- **Delivery Mode:** On Campus, Online, Hybrid
- **Entrance Exam:** None
- **Interview Required:** None

Application Deadlines

- **Fall:** January 9
- **Spring:** July 1

Plan Requirements

Students may choose from the course tracks below to complete coursework within a focus area.

Certificates earned will be distributed as: "Graduate Certificate in 5G Technologies" without focus area track specifications.

Code	Title	Hours
Required Courses		12
ECE 592	Special Topics In Electrical Engineering (LTE and 5G Communications (EOL))	
Select a course sequence under any track area listed under "Focus Area Tracks"		
Total Hours		12

Focus Area Tracks

Circuits

Code	Title	Hours
Course Sequence		
ECE 511	Analog Electronics	
ECE 712	Integrated Circuit Design for Wireless Communications	
ECE 792	Special Topics In Electrical Engineering (Design of Millimeter-Wave Circuits and Systems (EOL))	

Microwave Systems and Applied EM

Code	Title	Hours
Course Sequence		
ECE 524	Radio System Design	
ECE 549	RF Design for Wireless	
ECE 592	Special Topics In Electrical Engineering (Antennas and Arrays)	

Communications

Code	Title	Hours
Course Sequence		
ECE 575	Introduction to Wireless Networking	
ECE 766	Signal Processing for Communications & Networking	
ECE 570	Computer Networks	

Faculty

Full Professors

Harald Ade

David E Aspnes

B. Jayant Baliga

Mesut E. Baran

Salah M. A. Bedair

Subhashish Bhattacharya

Donald L. Bitzer

Alper Yusuf Bozkurt

Gregory T Byrd

Rada Yuryevna Chirkova

Mo-Yuen Chow

Huaiyu Dai

William Rhett Davis

Alexandra Duel-Hallen

Michael James Escuti

Do Young Eun

Brian Allan Floyd

Paul D. Franzon

Edward F. Gehringer

John J. Grainger

Edward Grant

Robert Wendell Heath

Brian L Hughes

Iqbal Husain

Ki Wook Kim

Frederick Anthony Kish Jr.

Robert Michael Kolbas

Hamid Krim

Ning Lu

Srdjan Miodrag Lukic

Leda Lunardi

Thomas Kenan Miller III

Veena Misra

Rainer Frank Mueller

John F. Muth

H. Troy Nagle Jr.

Jagdish Narayan

Arne Nilsson

Omer Oralkan

Mehmet Cevdet Ozturk

Harilaos George Perros

Douglas Stephen Reeves

Eric Rotenberg

Georgios Rouskas

Xipeng Shen

Mihail Lorin Sichitiu

Zlatko Sitar

Matthias F. M. Stallmann

Daniel D. Stancil

Michael B. Steer

J. K. Townsend

James Tuck

Daryoosh Vashaei

John Victor Veliadis

Ioannis Viniotis

Mladen Alan Vouk

Wenye Wang

Jonathan Wierer

Fen Wu

Huiyang Zhou

Associate Professors

Jacob James Adams

Dror Zeev Baron

Michela Becchi

Aranya Chakraborty

Stanley Cheung

Alexander G. Dean

Sevgi Gurbuz

Ali Gurbuz

Ismail Guvenc

Khaled Abdel Hamid Harfoush

Michael W. Kudenov

David S. Lalush

Edgar Lobaton

Zeljko Pantic

Nuria Gonzalez Prelcic

Anderson Rodrigo de Queiroz

David Ricketts
Nitin Sharma
Cranos M. Williams

Assistant Professors

Aydin Aysu
Amay Jairaj Bhandodkar
Michael Daniele
Demitry Farfurnik
Caterina M. Gallippi
Yaoyao Jia
Shih-Chun Lin
Yuan Liu
Jianqing Liu
Spyridon Pavlidis
Bradley Galloway Reaves
Muhammad Shahzad
Wenyuan Tang
Chau-Wai Wong
Tianfu Wu
Chenhan Xu

Practice/Research/Teaching Professors

Jordan Besnoff
Gregory Edward Bottomley
Laura J Bottomley
James Paul Dieffenderfer
Robert Joseph Evans
John Gajda
Rachana Ashok Gupta
Seth E. Hollar
Douglas C. Hopkins
Andrew J. Rindos III
Steven D. Jackson
Robert Dwight Oden Jr.

Bongmook Lee
David Lee Lubkeman
Hatice Orun Ozturk
Tania Milkova Paskova
James Lee Reynolds
Elena Nicolescu Veety
Leonard Wilson White
Donna G Yu
Wensong Yu

Professors Emeritus

George F. Bland
John R. Hauser
Wilbur Carroll Peterson
Winser E. Alexander PhD
Tildon H Glisson Jr
Michael A. Littlejohn
Carlton M. Osburn
Sarah Ann Rajala
Wesley E. Snyder

Adjunct Faculty

Mihail Devetsikiotis
Yan Solihin

Teaching Associate Professors

Mihail Cutitaru
Frederick J. Livingston