



**Department of Electronics & Telecommunication Engineering**  
**Faculty of Engineering**

**Course Profile**

<b>Course Title:</b> Cellular Network Planning		<b>Course Code:</b> ETE 6225
<b>Credit:</b> 3.0	<b>Total Mark:</b> 100	<b>Contact Hour:</b> 3.0 hrs per week

**Rationale:** This is where this course *Cellular Network Planning* comes in handy in master level. Covering the aspects that are required to design and optimize various types of networks ranging from GSM to EGPRS to UMTS and across all domains, radio, transmission and core, this course will definitely help people in the cellular industry to get their networks to a level where the subscribers will have a quality experience. Also, with an introduction to fourth generation technologies, this course offers a window towards what the future has in store for us. The course is designed to train the students extensively about Cellular networksplanning whichwill help them to apply in their higher studies and professional field.

- Objectives:**
1. To develop profound knowledge in cellular networks.
  2. To analyze hands-on problems in cellular network planning process.
  3. To be able design a cellular network.
  4. To improve communication skill through presentation.
  5. To develop leadership quality through Group work.
  6. To build up decision making ability through assignment.
  7. To expand confident by doing various practical problems.
  8. To become efficient by solving real life problems through case studies.

Learning Outcomes	Course Content	Teaching Learning Strategy	Assessment Strategy
1. Able to understand the basics of cellular network. 2. Able to draw and differentiate between different cellular network generations architecture.	<b>Lecture Module 1:</b> 1.1 Introduction to the course and necessary materials. 1.2 Introduction to Cellular networks. 1.3 Cellular Core principles. 1.4 Calling system of a cellular network. 1.5 Frequency plan, Capacity plan, Signaling plan. 1.6 Cellular Generations (1G, 2G, 2.5G, 3G, 4G)	Lecture, Discussion, Problem based learning, Exercise.	Q/A, MCQ, Viva Voce
1. Able to learn 2G radio network planning	<b>Lecture Module 2:</b> 2.1 2G Radio network	Lecture, Discussion,	Assignment, Q/A, MCQ, Viva

<p>basics.</p> <ol style="list-style-type: none"> <li>2. Able to prepare site survey, capacity plan, frequency plan</li> <li>3. Able to design a path loss model for RN.</li> <li>4. Able to make a link budget for radio network planning.</li> </ol>	<p>planning basics.</p> <ol style="list-style-type: none"> <li>2.2 Radio network planning process, radio cell wave propagation, dimensioning.</li> <li>2.3 Radio network Preplanning, site survey.</li> <li>2.4 Radio network detail planning, link budget, power control, capacity planning.</li> <li>2.5 Radio network optimization, KPI, Performance monitoring.</li> </ol>	<p>Problem based learning, Exercise.</p>	<p>Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to learn the basics of transmission network planning.</li> <li>2. Able to illustrate transmission network planning process.</li> <li>3. Able to understand 2mbps plan, network topology, site selection.</li> <li>4. Able to create LOS measurement, MW planning.</li> </ol>	<p><b>Lecture Module 3:</b></p> <ol style="list-style-type: none"> <li>3.1 Basics of transmission network.</li> <li>3.2 Transmission network planning process.</li> <li>3.3 Preplanning of transmission network, equipment location, topology, site selection, LOS, MW link planning.</li> <li>3.4 Detailed planning, frequency planning, time slot allocation, 2 Mbps plan, synchronization planning.</li> <li>3.5 Transmission Network optimization.</li> </ol>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to design core network with network dimensioning.</li> <li>2. Able to prepare traffic analysis.</li> <li>3. Able to learn IN, Failure analysis and protection.</li> </ol>	<p><b>Lecture Module 4:</b></p> <ol style="list-style-type: none"> <li>4.1 Basics of Core network planning</li> <li>4.2 Core network planning process, network analysis, dimensioning.</li> <li>4.3 Signaling plan, signaling points.</li> <li>4.5 Intelligent Network</li> <li>4.6 Failure analysis and protection.</li> <li>4.7 Detailed planning</li> <li>4.8 Network optimization</li> </ol>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to understand 2.5G network basics.</li> <li>2. Able to learn GPRS architecture.</li> <li>3. Able to know GPRS network planning and optimization.</li> </ol>	<p><b>Lecture Module 5:</b></p> <ol style="list-style-type: none"> <li>5.1 GPRS network planning, SGSN, GGSN, MGW.</li> <li>5.2 Protocol structure in GPRS network.</li> <li>5.3 GPRS Radio, core network planning.</li> <li>5.4 GPRS network optimization.</li> </ol>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to understand 2.5G network basics.</li> <li>2. Able to learn EDGE architecture.</li> <li>3. Able to know EDGE network planning and optimization.</li> </ol>	<p><b>Lecture Module 6:</b></p> <ol style="list-style-type: none"> <li>6.1 The EDGE system.</li> <li>6.2 EDGE network planning.</li> <li>6.3 Dimensioning.</li> <li>6.4 EDGE network optimization.</li> </ol>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>

<ol style="list-style-type: none"> <li>1. Able to learn 3G radio network basics.</li> <li>2. Able to understand UTRAN, Spreading methods.</li> <li>3. Able to learn multipath propagation and interferences.</li> <li>4. Able to learn radio network planning process.</li> <li>5. Able to prepare a link budget.</li> <li>6. Able to identify KPI of 3G RN.</li> </ol>	<p><b>Lecture Module 7:</b></p> <p>7.1 3G radio network planning basics, system requirements, WCDMA radio fundamentals, UMTS service classes.</p> <p>7.2 Radio interface protocol architecture, UTRAN.</p> <p>7.3 The spreading phenomena, Symbols and chips, scrambling.</p> <p>7.4 Multipath propagation and effects.</p> <p>7.5 Radio network planning process, code planning, power control, handover, Adaptive multi-rate.</p> <p>7.6 Detailed planning.</p> <p>7.7 3G radio network optimization, parameter tuning, KPI.</p>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to understand 3G transmission network system.</li> <li>2. Able to learn TN planning process.</li> <li>3. Able to make TN dimensioning.</li> <li>4. Able to understand ATM cell structure.</li> <li>5. Able to learn network optimization.</li> </ol>	<p><b>Lecture Module 8:</b></p> <p>8.1 Basics of 3G transmission network planning.</p> <p>8.2 Transmission network planning process,</p> <p>8.3 ATM planning, cell structure, protocol layers.</p> <p>8.4 Network Dimensioning</p> <p>8.5 MW link plan</p> <p>8.6 Detailed planning, traffic management, parameter plan, network management.</p> <p>8.6 Transmission network optimization, network analysis, parameter setting.</p>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to learn CAMEL, IN in 3G core network.</li> <li>2. Able to understand IP Multimedia System in 3G Core network.</li> </ol>	<p><b>Lecture Module 9:</b></p> <p>9.1 3G core network basics.</p> <p>9.2 Core network planning (CS, PS planning)</p> <p>9.3 End to end QoS.</p> <p>9.4 Core network architecture of 3GPP Rel. 99, 3GPP Rel. 4 &amp; 3GPP Rel. 5.</p> <p>9.5 The IMS, IMS architecture, Functional elements.</p>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to learn 4G technology.</li> <li>2. Able to understand the challenges in 4G network.</li> </ol>	<p><b>Lecture Module 10:</b></p> <p>10.1 Introduction to 4G mobile networks.</p> <p>10.2 Key technologies for 4G network, OFDM, All IP.</p> <p>10.3 Challenges in 4G network.</p>	<p>Lecture, Discussion, Problem based learning, Exercise.</p>	<p>Assignment, Q/A, MCQ, Viva Voce, Observation</p>
<ol style="list-style-type: none"> <li>1. Able to plan/ design a cellular network.</li> </ol>	<p><b>Lecture Module 11:</b></p> <p>Course Review, Discussions &amp; Presentation, Course Assignment.</p>	<p>Lecture, Discussion</p>	<p>Presentation</p>

## Recommended Books and Materials

<b>Text Books:</b> 1. <b>Fundamentals of Cellular Network Planning and Optimization</b> By Ajay R. Mishra	<b>References:</b> 1. <b>Wireless and cellular communication (3<sup>rd</sup> Edition)</b> By William C.Y. Lee 2. <b>Advanced cellular network planning and Optimization</b> By Ajay R. Mishra 3. <b>Wireless and Mobile Communications (2<sup>nd</sup> Edition)</b> By William Stallings 4. <b>Google Classroom.</b>
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### Grading and Testing Procedure:

Quiz/ Class Test	:	10%
Assignment	:	15%
Presentation	:	10%
Midterm Exam	:	25%
Semester Final Examination	:	40%
<b>Total Marks</b>	<b>:</b>	<b>100%</b>

### Grade and GPE:

A student may earn letter grades on the basis of his/ her performance in the course. The numerical equivalents of the grades and grade points are given below.

Marks Obtained Out of 100	Grade	Grade Point Equivalent	Remarks
80-100	A+	4.00	Outstanding
75-79	A	3.75	Excellent
70-74	A-	3.50	Very Good
65-69	B+	3.25	Good
60-64	B	3.00	Satisfactory
55-59	B-	2.75	Above Average
50-54	C+	2.50	Average
45-49	C	2.00	Below Average
40-44	D	1.00	Pass
00-39	F	0.00	Fail

### Prepared by

#### **Md. Taslim Arefin**

Associate Professor

Dept. of Electronics and Telecommunication Engineering (ETE)

Faculty of Engineering (FE)

Daffodil International University

Personal Web: [www.daffodilvarsity.edu.bd/faculty/taslim](http://www.daffodilvarsity.edu.bd/faculty/taslim)

Email: [arefin@daffodilvarsity.edu.bd](mailto:arefin@daffodilvarsity.edu.bd), [arefin@diu.edu.bd](mailto:arefin@diu.edu.bd)

Cell: +8801711227391

Office Phone: +88-02-9138234-5, Ext 139

