E: PHEMT (p. 1) ECSE 573 2006

[1] Introduction

[2] Principles of a conventional MOSFET transistor
Cross-section, structure, doping distribution,
electric field distribution

[3] Gate capacitance, accumulation mode, depletion mode,
inversion mode, pinch-off.

[4] Current-voltage characteristics. Equivalent circuits.

[5] Status of MOSFET technology for RF circuit applications.

[6] Limitations of the conventional MOSFET for high frequency operation

[7] Introduction to MESFET

[8] Differences between a MOSFET and a MESFET.

[9] Metal-semiconductor Schottky junctions

[10] Structure, electric field and dopant distribution of a MESFET. Gate contact, source contact and drain contact.

[11] Currents in a MESFET
Depletion width
Channel conductance with voltage, pinch-off
Gain

E: PHEMT (p. 2)

[12] Non-ideal characteristics
Short channel MESFET
Two-dimensional current flow

[13] Cut-off frequency and power-frequency performance.

[14] Small signal characteristics
Simplified circuit model
RF models for MESFETs

[15] Status of MESFET technology for microwave and millimeter wave applications. Introduction to two application examples.

[16] Introduction to HEMT

[17] Why high electron mobility in FETs is required and how to achieve the high mobility (principles)

[18] HEMTs in InP and GaAs systems

[19] Structure of PHEMTs in InP system

E: PHEMT (p. 3)

[20] equivalent circuit of a PHEMT

[21] Advantages of the PHEMT over MESFETs

[22] Introduction to PHEMT circuits for millimeter/microwave applications.

[23] A comprehensive survey on the development of PHEMT devices

[24] A survey on the manufacturers of microwave and millimeter wave circuits involving PHEMTs.

[25] Evolution of the microwave and millimeter wave markets involving PHEMTs.

Presentation package No. D-1:	items [1] to [6]	Hadley	11/14
Presentation package No. D-2:	items [7] to [12]	Qing	11/16
Presentation package No. D-3:	items [13] to [18]	Guillaume	11/21
Presentation package No. D-4:	items [19] to [25]	Li	11/23

References:

[1] "Fundamentals of III-V Devices," by William Liu, Wiley InterScience, 1999.

[2] Papers from IEEE Microwave Theory and Techniques (IEEE-MTT)

[3] Papers from "Microwave Journal" and "Microwave and Optical Technology Letters."

[4] "Semiconductor Physics and Devices, Basic Principles," 2nd Edition, by Neamen, Donald A.; Irwin McGraw-Hill, 1997.