305426 Medical Electronic Engineering

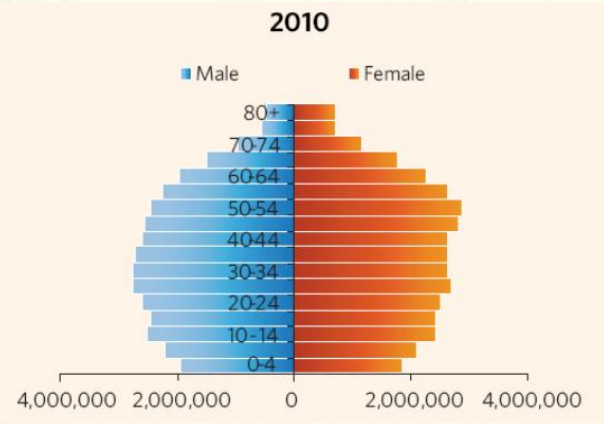
Medical Devices

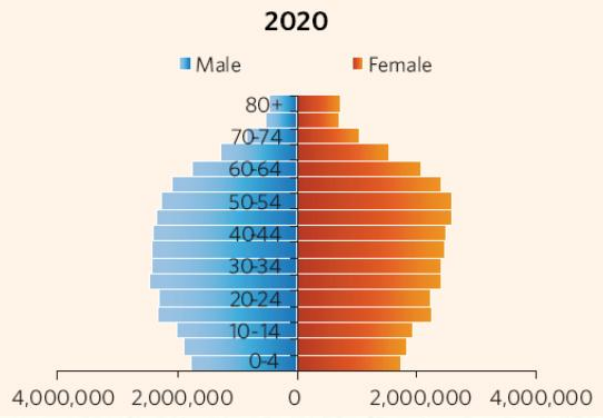
Introduction

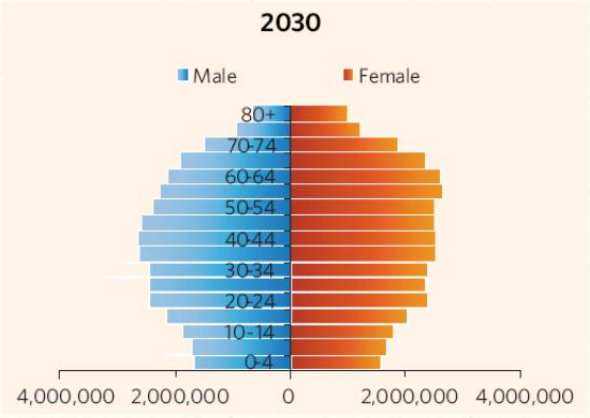
Medical Electronic Devices

- Basic Electronics (Electronic devices, Amplifiers, A/D, D/A)
- Electrodes
- EEG
- Deep brain stimulator
- ECG
- Cardiac Pacemakers
- External Defibrillators
- EMG
- Neuromuscular Electrical stimulators
- Noise and EMC
- Safety

Population Aging in Thailand







Indicator	2000	2005	2010	2015	2020	2025	2030	2035	2040
Population (thousands)	63 155	66 698	69 122	70 876	72 091	72 884	73 321	73 379	72 994
Population sex ratio (males per 100 females)	96.9	96.8	96.6	96.4	96.0	95.7	95.4	95.2	95.0
Percentage aged 0-4 (%)	7.4	7.1	6.3	5.7	5.2	4.9	4.8	4.7	4.7
Percentage aged 5-14 (%)	16.6	15.3	14.2	13.1	12.0	11.0	10.3	10.0	9.9
Percentage aged 15-24 (%)	17.1	16.0	15.1	14.4	13.6	12.7	11.7	10.9	10.3
Percentage aged 60 or over (%)	10.3	11.4	12.9	15.3	18.3	21.3	24.3	26.8	28.8

Assistive Technology

- M[illegible]:

Medical Devices

- A medical device is an apparatus that is used in the diagnosis, mitigation, therapy, or prevention of disease and that does not attain its primary purpose through chemical action.

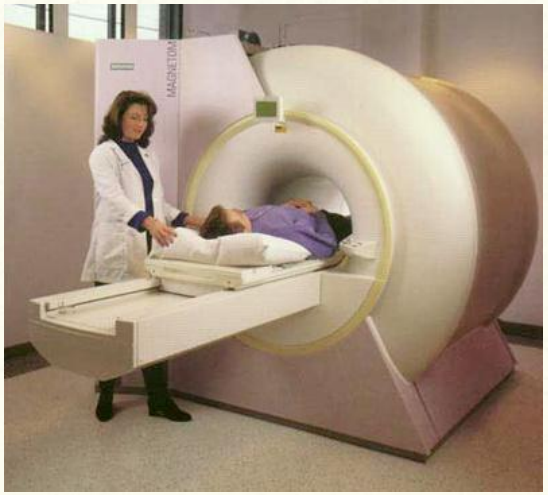
Purposes	Examples
Diagnosis, Monitoring	
Prevention	
Mitigation	
Therapy	

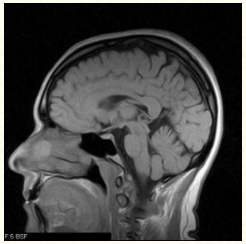
Medical Devices

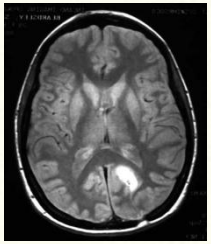
Purposes	Examples	
Diagnosis, Monitoring	Medical instruments	ECG, EMG, EEG, Ultra sound scanner, Magnetic resonance imaging (MRI), Nuclear magnetic resonance (NMR), Near-Infra-red Spectroscopy (NIRS), Blood pressure monitor, Pulse oximeter, Computer assisted tomography (CT), X-ray, Thermometer, Endoscope, Positron emission Tomography (PET)
Prevention	Medical instruments	Same as above, Gloves, Condom
Mitigation	Life support devices, Orthoses, Home health and consumer devices	Ventilator, Cardiac pace maker, Deep brain stimulator, Electrical stimulator, Hemodialysis machines, Powered wheelchair, Infusion pump, Walkers, Functional electrical stimulator
Therapy	Surgery devices, Dental devices, Cosmetic devices, General hospital supplies, and Prostheses	Laser surgery, Defibrillators, Artificial heart, Cochlear Implants, Hips prostheses, Knee prostheses, Electrical stimulator, contact lens, Robotic surgery, Balloon catheter and stent, Cardiac pacemaker, Cardiopulmonary bypass, Heart valve replacement, Contacts lens, Functional electrical stimulator, Artificial leg.

Medical Devices

- Magnetic resonance imaging (MRI)





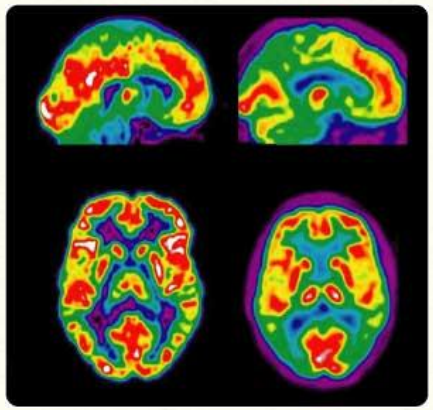


- Ultra sound scanner

Medical Devices

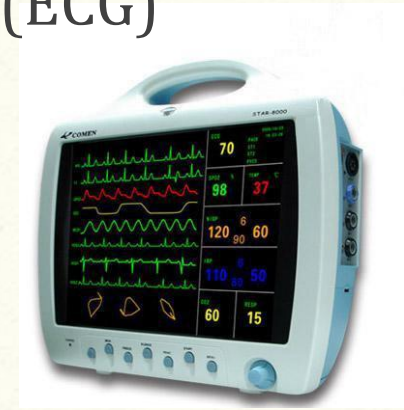
- Computer assisted thermography (CT)

- Positron emission Tomography (PET)



Medical Devices

- Electrocardiogram (ECG)



- Electroencephalogram (EEG)

Medical Devices

- Endoscope

- Pulse oximeter

Medical Devices

- Ventilator

- Infusion pump

Medical Devices

- Deep brain stimulator

- Electrical stimulator

Medical Devices

- Hemodialysis machines

- Powered wheelchair

Medical Devices

- Robotic surgery

da Vinci surgical system

- Laser surgery

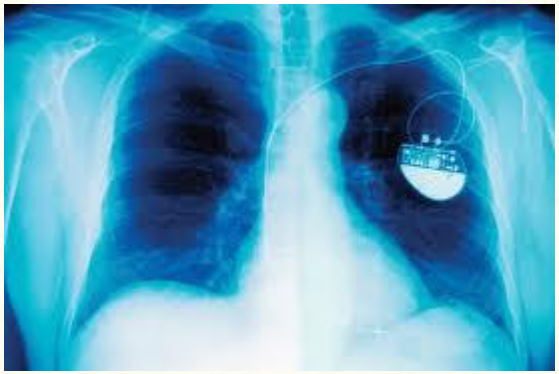
Medical Devices

- Defibrillator

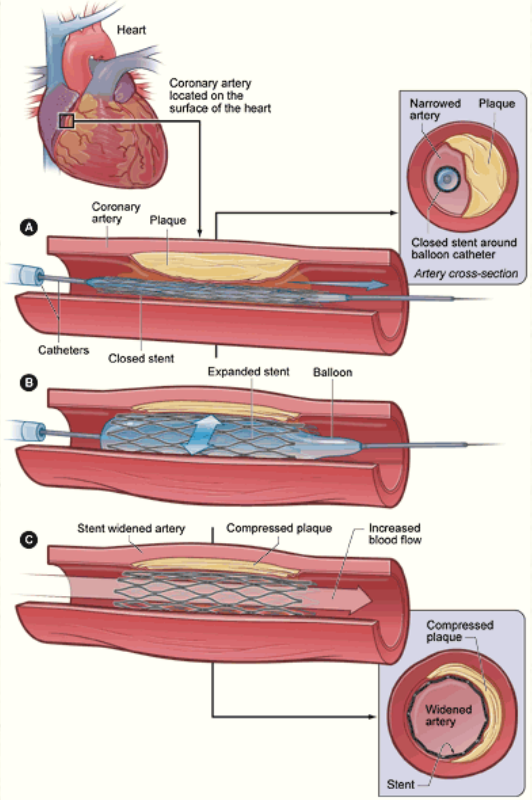
- Artificial heart

Medical Devices

- Cardiac pace maker

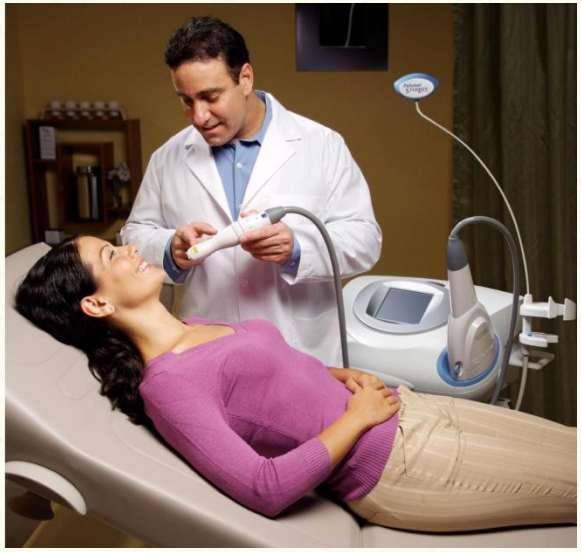


- Balloon catheter and stent

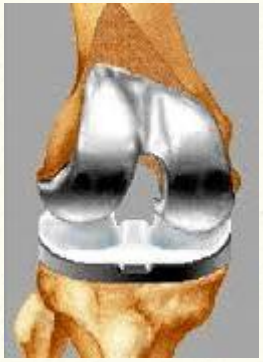


Medical Devices

- Laser Treatment

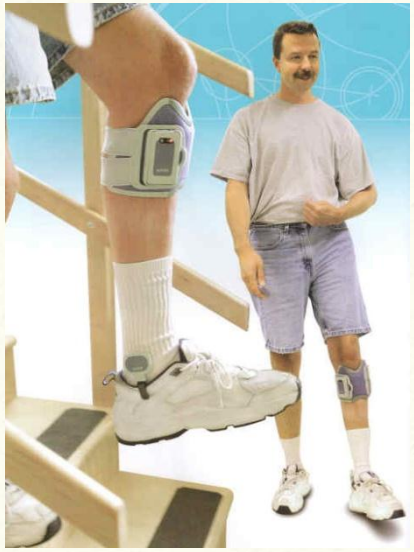


- Hips and Knee prostheses



Medical Devices

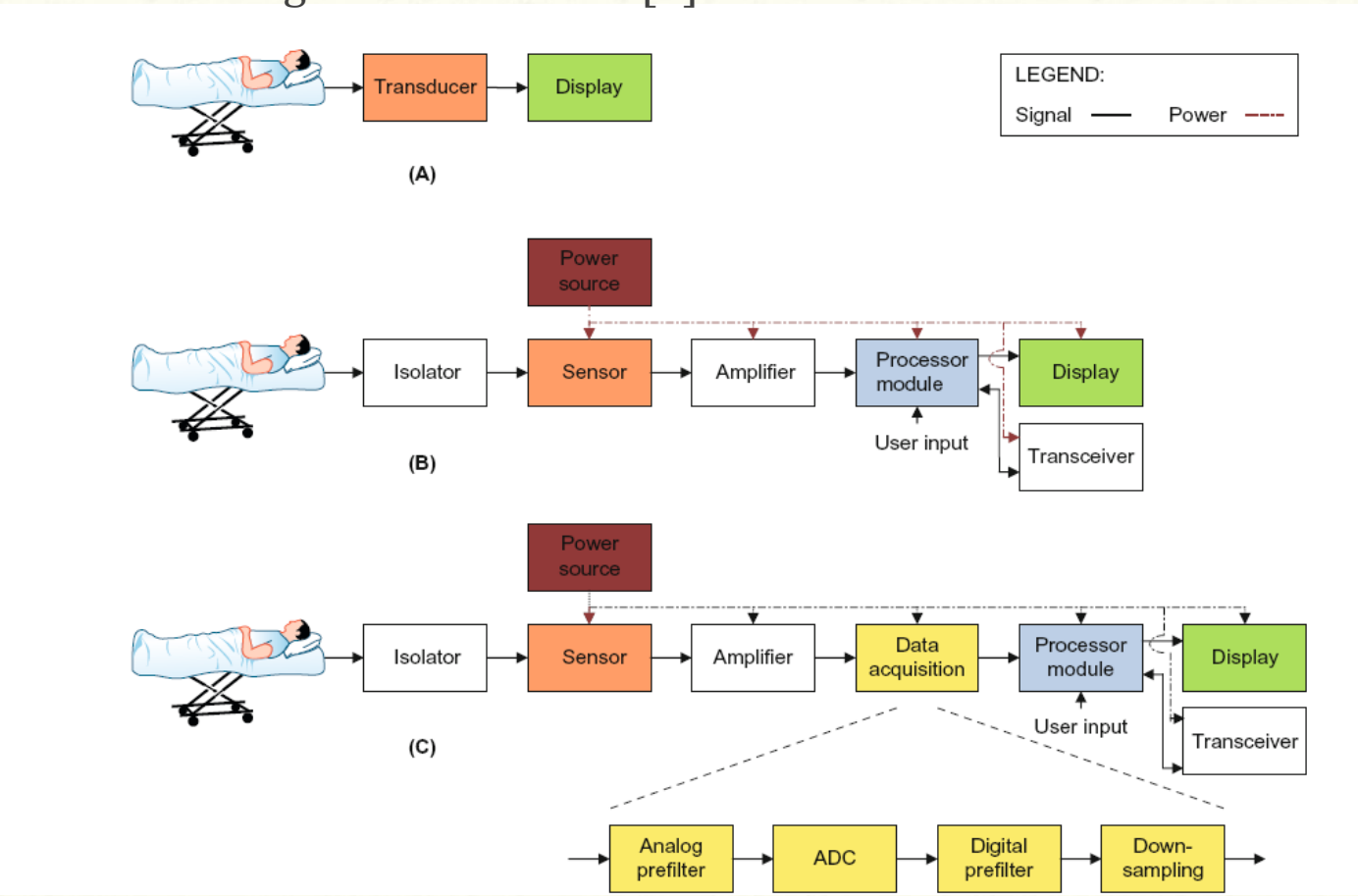
- Functional electrical stimulator



- Artificial leg

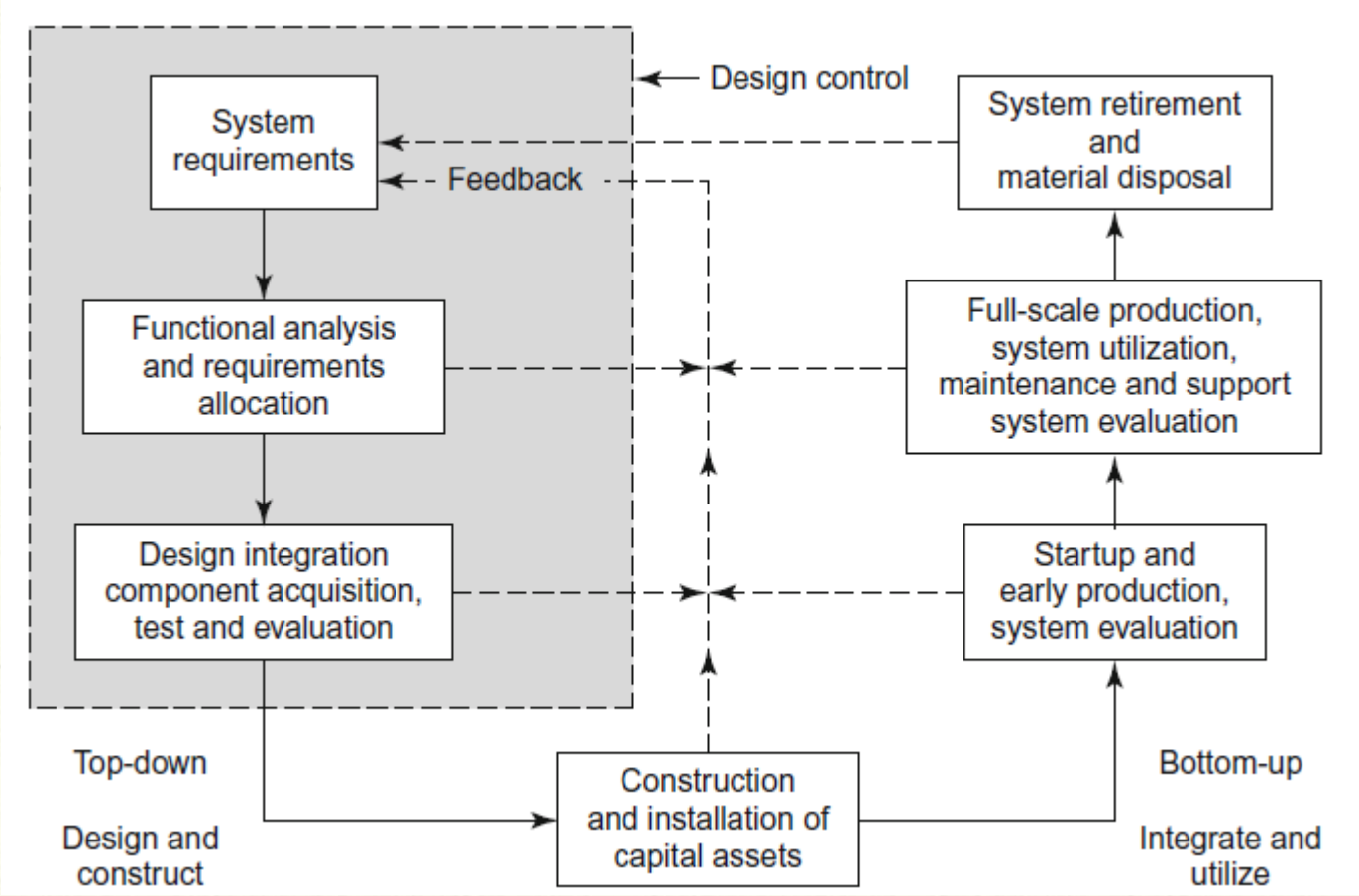
Medical Instruments

- A medical instrument is a medical device that makes measurements, often for the diagnosis of disease. [4]



System Development

Top-down/bottom-up system development process [Adapted from Blanchard(2008)]



References

1. Fundamental of Anatomy and Physiology, Frederic H. Martini
2. Biomedical Instrumentation: Application and Design, John G. Webster
3. Introduction to Medical Electronics Applications, D. Jennings
4. Medical Device Technologies: A Systems Based Overview Using Engineering Standards, Gail D. Baura