



INTRODUCTION TO ORBITAL MECHANICS - MODEL & SIMULATION SOFTWARE (OM-MSS)

Earth, Sun, Moon & Satellites Motion in Orbit - Model & Simulation Software

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(This is Introduction, pp 1 - 5, of Orbital Mechanics - Model & Simulation Software (OM-MSS), Sec 1 to 10, pp 1 - 402.)

INTRODUCTION : Orbital Mechanics - Model & Simulation Software (Om-Mss)

A Monograph of Earth, Sun, Moon & Satellites Motion in Orbit with Examples, Problems and Software Driven Solutions.

We look into space from Earth, which is 3rd planet from Sun. Earth takes around 365.25 days to moves around Sun in an Elliptical orbit.

The average distance from the Earth to the Sun is called one Astronomical Unit (AU); 1 AU = 149,597,870.7 km.

Mars, is 4th planet from Sun, that takes 686.971 Earth days to orbit around Sun. The orbital path of Mars is highly eccentric.

Mars & Earth move along their orbits, and come near to one another approximately every two years. This approach of coming near facilitate launching of spacecraft every two years, even that takes about eight months to reach Mars.

Example : On Apr. 08, 2014, the near or close distance between Mars and Earth was 92.4 million km.

Moon moves around Earth in the same kind of orbit. The Moon is the Earth's only natural Satellite.

The average distance of the Moon from the Earth is 384,403 km.

A Satellite is an artificial object, intentionally placed into orbit. Thousands of Satellites are launched into orbit around Earth.

A few Satellites called Space Probes have been placed into orbit around Moon, Mercury, Venus, Mars, Jupiter, Saturn, etc.

Understanding the motion of Earth around Sun, and the motion of Moon and Satellites around Earth is of interest to many.

Presented here a Monograph of 'ORBITAL MECHANICS - MODEL & SIMULATION SOFTWARE (OM-MSS)', to Simulate Motion of Sun, Earth, Moon & Satellites.

The OM-MSS Software is written in 'C' Language, the Compiler used is Dev C++ and the Platform is a Windows 7, 64 bit Laptop.

The Source Code, around 30,000 Lines, is Compiled. The 'OM-MSS.EXE' File generated is of Size 1.5 KB.

The Executable File, < OM-MSS.EXE >, is RUN Step-by-Step for a Set of Inputs. The Results seen on Computer Screen are put in a File,

Which in effect becomes '**A Monograph of Orbital Mechanics with Examples, Problems and Software Driven Solutions**'.

The execution of 'Orbital Mechanics - Model & Simulation Software (OM-MSS)', illustrates its Scope, Capability, Accuracy, and Usage.

The OM-MSS Software is quite exhaustive for beginners, experts, researchers & professional in Spherical Astronomy.

The source code of OM-MSS Software in full or in parts has a cost if there is buyer. The cost has not been evaluated / decided.

The OM-MSS Software includes the following :

(a) **Astronomical Time Standards and Time Conversions Utilities** :

GMT - Greenwich Mean Time, **LMT** - Local Mean Time, **LST** - Local Sidereal Time, **UT** - Universal Time,
ET - Ephemeris Time, **JD** - Julian Day, **Standard Epoch J2000**, **Gregorian Calendar** date and more.

(b) **Positional Astronomy of Earth, Sun, Moon, and Satellites Motion in Orbit, includes computations of** :

- * Position of Sun and Position of Earth on Celestial Sphere at Epoch ;
- * Keplerian elements : Inclination, RA of asc. Node, Eccentricity, Arg. of Perigee, Mean Anomaly, Mean Motion;
- * Motion Irregularities : Mean, Eccentric and True anomaly in deg;
- * Precise Time at Earth Orbit Points : Perihelion, Aphelion, Equinoxes, Solstices, Semi-Major & Minor-axis;
- * Astronomical years : Anomalistic, Tropical, and Sidereal Years;
- * Four Seasons : Spring, Summer, Autumn and Winter start time and duration;
- * Position of Satellites around Earth : Keplerian elements and State Vectors at epoch, and computing,
Sub-Sat point lat/long, EL & AZ angles, Distances, Velocity, and more;
- * Satellite Pass, Ground Trace for Earth Stn using NASA/NORAD 2-line bulletins;

(c) **Customized Utilities and products** : On special request either developed or configured and generated.

These are Presented in Section - 1 to 8. The Section - 9 Contains References, and Section - 10 Contains few related Diagrams.

Next : Content Index Table.

Index Table : OM-MSS Sections / Sub Sections, Pages & Titles. (the page number is same as seen in the pdf document status bar)

SECTIONS	PAGES	CONTENTS : Sections / Sub Sections Titles
1	6	ASTRONOMICAL TIME STANDARDS AND TIME CONVERSION UTILITIES.
1.1	12	Conversion of Universal Time (year, month, day, hour decimal) To Julian Day.
1.2	13	Conversion of Julian Day To Universal Time (year, month, day, hour decimal).
1.3	14	Conversion of Fundamental Epoch To Julian day and Julian century.
1.4	15	Add or Subtract time (days, hour, minute seconds) to or from input time.
1.5	16	Julian day for start of any Year.
1.6	17	Solar Time : Local Mean Solar Time (LMT) over observer's Longitude, and Greenwich Mean Time (GMT).
1.7	21	Sidereal Time : Greenwich universal time at hour 0.0 (ST0) and Greenwich Mean Sidereal Time (GMST) at input UT.
1.8	24	Sidereal Time : Greenwich Sidereal Time (GST), Greenwich Hour Angle (GHA), and Mean Sidereal Time (MST) at input UT.
1.9	26	Sidereal Time : LMST is Local Mean Sidereal time over observer's Longitude and GMST is Greenwich Mean Sidereal Time.
1.10	28	Time Conversions : LMT to LST, LST to LMT, LMT to LMST, LMST to LMT.
1.11	32	Concluding Time Standards and Time Conversion Utilities (Sections 1.0 to 1.10).
2	33	POSITIONAL ASTRONOMY : EARTH ORBIT AROUND SUN, ANOMALIES & ASTRONOMICAL EVENTS - EQUINOXES, SOLSTICES, YEARS & SEASONS.
2.1	41	Earth Orbit : Constants used in OM-MSS Software.
2.2	43	Earth Mean anomaly and True anomaly at Input UT, Since Standard Epoch J2000, using standard analytical expressions.
2.3	44	Earth Orbit Input Year : Precise Universal Time (UT) at orbit points - Perihelion and Aphelion.
2.4	46	Earth Orbit Input Year : Precise Universal Time (UT) at orbit points - Vernal Equinox and Autumnal Equinox.
2.5	47	Earth Orbit Input Year : Precise Universal Time (UT) at orbit points - Summer Solstice and Winter Solstice.
2.6	48	Earth Orbit Input Year : Precise Universal Time (UT) at orbit points - Semi-Major Axis and Semi-Minor Axis.
2.7	49	Earth Orbit Input Year : Astronomical Years - Anomalistic, Tropical, and Sidereal Years.
2.8	50	Earth Orbit Oblateness : Semi-Major Axis and Semi-Minor Axis.
2.9	52	Earth Orbit Input Year : Mean anomaly, Eccentric anomaly, True anomaly at UT, based on algorithms of iterative method.
2.10	54	Earth Orbit Input Year : Four Seasons - Spring, Summer, Autumn, and Winter.
2.11	56	Concluding Astronomical Events Anomalies, Equinoxes, Solstices, Years & Seasons (Sections 2.0 to 2.10).

3	57	POSITION OF SUN ON CELESTIAL SPHERE AT INPUT UNIVERSAL TIME (UT).
3.1	59	Sun Positional Parameters on Celestial Sphere : Input Time (UT) Standard Epoch JD2000.
3.2	60	Sun Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Perihelion.
3.3	61	Sun Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Vernal equinox.
3.4	62	Sun Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Summer solstice.
3.5	63	Sun Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Aphelion.
3.6	64	Sun Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Autumnal equinox.
3.7	65	SUN Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Winter solstice.
3.8	66	Concluding Sun Position on Celestial Sphere (Sections 3.0 to 3.7).
4	68	POSITION OF EARTH ON CELESTIAL SPHERE AT INPUT UNIVERSAL TIME (UT).
4.1	71	Earth Positional Parameters on Celestial Sphere : Input Time (UT) Standard Epoch JD2000.
4.2	84	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Perihelion.
4.3	97	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Vernal equinox.
4.4	110	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Summer solstice.
4.5	123	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Aphelion.
4.6	136	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Autumnal equinox.
4.7	149	Earth Positional Parameters on Celestial Sphere : Input Year Time when Earth is at Winter solstice.
4.8	162	Concluding Earth Position on Celestial Sphere (Sections 4.0 to 4.7).
5	164	SATELLITES ORBIT ELEMENTS : EPHEMERIS, Keplerian ELEMENTS, STATE VECTORS
5.1	170	NASA/NORAD 'Two-Line Elements'(TLE) Ephemeris data set.
5.2	174	Conversion of Keplerian Element Set to State Vector Set and vice versa.
5.3	186	Satellite Orbit Keplerian element set at Perigee prior to Epoch.
5.4	192	Concluding Satellites Ephemeris Data Set (Sections 5.0 to 5.3).

6.	193	SATELLITES MOTION AROUND EARTH : ORBITAL & POSITIONAL PARAMETERS AT EPOCH.
6.1	195	LANDSAT 8 : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.2	207	SPOT 6 : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.3	219	CARTOSAT 2B : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.4	231	ISS (ZARYA) : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.5	243	GSAT-14 : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.6	255	MOON : Orbital & Positional parameters corresponding to input 'Two-Line Elements' (TLE) Bulletins.
6.7	267	Concluding Satellites Orbital & Positional Parameters At Epoch (Sections 6.0 to 6.6).
7	268	SATELLITE PASS FOR EARTH STN - PREDICTION OF GROUND TRACE COORDINATES, LOOK ANGLES, UNIVERSAL/LOCAL TIME & MORE.
7.1	270	LANDSAT 8 : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.2	290	SPOT 6 : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.3	310	CARTOSAT 2B : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.4	330	ISS (ZARYA) : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.5	350	GSAT-14 : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.6	370	MOON : Sat Pass for Earth Stn - Prediction of Ground Trace, Look Angles & more at Instantaneous Time.
7.7	390	Concluding Satellites Passes - Prediction of Ground Trace Coordinates, Look Angles & more at Instantaneous Time.
8	391	CONCLUSION : ORBITAL MECHANICS - MODEL & SIMULATION SOFTWARE (OM-MSS).
9	392	REFERENCES : TEXT BOOKS & INTERNET WEB LINKS.
10	399	ANNEXURE : A Collection of few related Diagrams / Help.

Move on to Section (1 to 9) While the Executable File, < OM-MSS.EXE >, is RUN for a Set of Inputs.